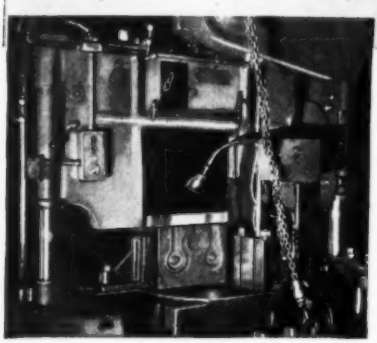
MACHINE TOOL BLUE BOOK

JANUARY

HE NEW HARDINGE ELMIRA, N.Y. PRECISION LATHE

Specify this machine to step up precision production in your tool room and development departments. 1" collet capacity, 9" swing, speeds to 4000 r.p.m.

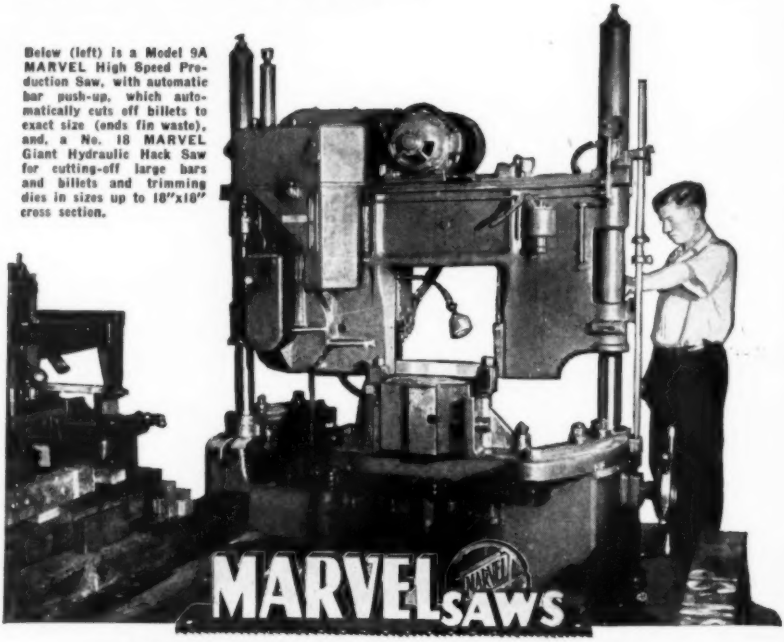
Marvel Saws Cut off Hours from Die Maintenance Time



Hubbard & Company, Pittsburgh, manufacturers of pole line hardware, picks, hammers and other drop forged specialties, use MARVEL Saws to eliminate tedious hours in making and maintaining their giant forging dies. Not only do these saws do all regular cutting-off of steel for the machine shop, die blocks for die shop and exact size billets for the forge shop, they also materially cut the cost of die maintenance.

Previously, it was necessary to plane the face of dies being reworked. This was a long and tedious job because the die face is always work-hardened with hard spots that had to be chipped or ground out before the planer tool could make a cut. Now with MARVEL Saws, the face of a die is speedily and accurately "skinned"—a thin slice is sawed off just behind the hard spots, after this speedy "skinning" and a single facing cut on the planer, the die is ready for the die sinker. This modern MARVEL method is saving Hubbard a lot of dies, materials, labor and machine time.

Below (left) is a Model 9A MARVEL High Speed Production Saw, with automatic bar push-up, which automatically cuts off billets to exact size (ends fin waste), and, a No. 18 MARVEL Giant Hydraulic Hack Saw for cutting-off large bars and billets and trimming dies in sizes up to 18"x18" cross section.



ARMSTRONG-BLUM MFG. CO.

5700 Bloomingdale Avenue — *"The Hack Saw People"* — Chicago 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

Courtesy U.S. Signal Corps.

simplicity, speed and efficiency

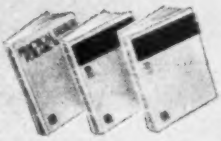
Army veterans know all about Hobart "Simplified" Arc Welders from practical experience . . . the weldors can tell you about the ease in securing the correcf welding heat; about its simplified operation . . . others tell you how fast the welding jobs were turned out; how strong and tough were the welds. Hobart will do this on your work, too, regardless of what type of arc welding work you have in mind.

Look at Hobart's Features

The Multi-Range Dual Control gives you a choice of 1000 combinations of welding heat, instantly available. The Remote Control feature allows you to adjust welding current regardless how far the machine may be from the work. Other features offer greater welding ease and more years of useful operation. Check coupon for details.

"Practical Design for Arc Welding"

Three volumes of detailed arc welding design short-cuts, especially for weldors, engineers, designers. Each volume $3.50, or all three for $10.00.



Practical Arc Welding

Lessons in Arc Welding

You'll like HOBART Electrodes

Precision built and inspected, you'll soon find Hobart Electrodes to be your favorite. They're made in a modern plant, completely equipped with the newest machinery. There's a size and type for every welding job . . . for all types of metal. Write for details.

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"One of the World's Largest Builders of Arc Welders"

REACH FOR YOUR SCISSORS!

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ONE OF THE WORLD'S LARGEST BUILDERS OF ARC WELDERS

COLLETS

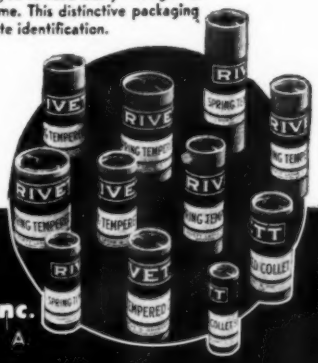
Guaranteed * TO RUN DEAD TRUE

Work held in a Rivett Collet is guaranteed to run "dead true" at the Collet mouth and within .002" two inches from the Collet mouth. Rivett Draw-In Collets are available in all standard styles for bench lathe, engine lathe, miller and grinder use.

They have personality derived from a worthy inheritance and a steadily improved environment. When shipped, each Rivett Collet reflects more than fifty years of Collet manufacturing "know-how" and the most advanced machining and inspection.

See how the individual cartons permit you to read easily through the "window" the style, size and Rivett name. This distinctive packaging provides protective storage with absolute identification.

* For complete information on all Rivett Collets and their adaptation to existing machines write for Bulletin 100C.



RIVETT

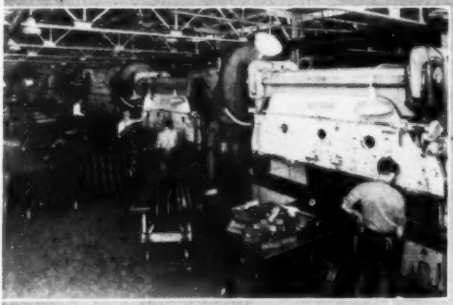
RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS · U S A

BULLETIN NO. 100C

"TRAILBLAZERS"

Grow on this line . . .



Long line! Long parts! Short time! That is the nutshell story of Trailblazer production. Nearly a tenth of a mile of Shears and Brakes meets this intensive production problem. This team of Cincinnati Shears and Cincinnati Press Brakes, with their accurate performance and ample working lengths, smoothly and economically handles the long pieces required.

Write us on your shearing and forming problems. A complete Shear Catalog, No. S-4, and Brake Catalog, No. B-2, are available on request.

● *Photos: Courtesy of Trailmobile Co.*

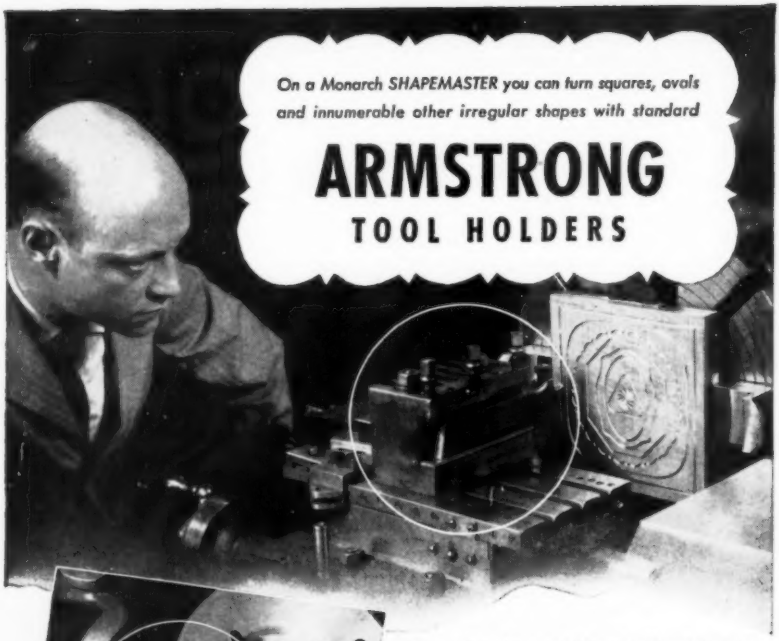
THE CINCINNATI SHAPER CO.

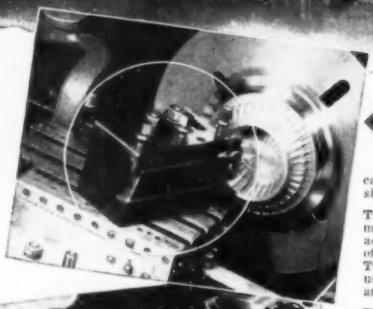
CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

On a Monarch SHAPEMASTER you can turn squares, ovals and innumerable other irregular shapes with standard

ARMSTRONG
TOOL HOLDERS





The phenomenal Monarch **SHAPEMASTER** performs the most astonishing operations. Basically a 20" Monarch Lathe, when fitted with the **SHAPEMASTER** Mechanism, it will turn squares, ovals, hexagons, octagons and multiple sided shapes in irregular contour pieces. Almost any desired shape can be transmitted by the cutting point to either outside or inside diameter or face of the work.

The result of many years of engineering and development, the **SHAPEMASTER** is distinctly **modern** and advanced in its design in every detail. Still, for most of its unusual operations it is tooled with **ARMSTRONG TOOL HOLDERS**, of the standard types universally used on ordinary lathes in 98% of the machine shops and tool rooms.

These **ARMSTRONG TOOL HOLDERS** are selected not only because they "Save: All Forging, 70% Grinding and 90% High Speed Steel" but also because they have the strength to support the cutting edge rigidly not only against a normal down feed but against end thrust, side and torsional strain as well.

ARMSTRONG BROS. TOOL CO.

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Machine Tool Blue Book

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Published Monthly *Volume 42, No. 1*

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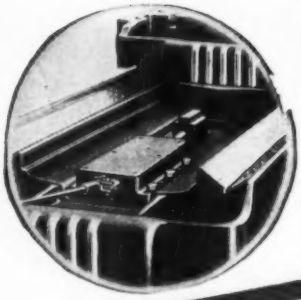


Designed for greater safety at higher speeds

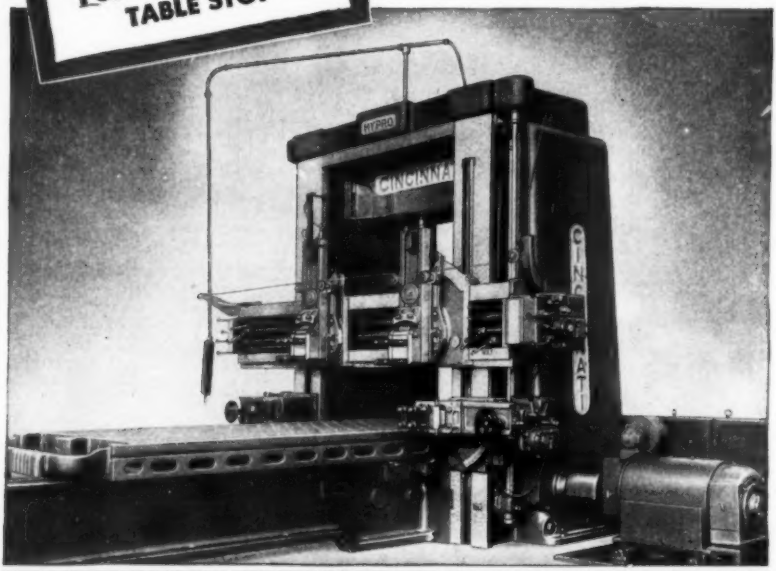
It is now possible to obtain a positive hydraulic safety stop and jack to completely protect anything around the machine in case of complete failure of the electrical control.

This safety stop is designed to stop the table quickly in case of control failure with a uniform decelerated motion without severe shock to parts of the Planer. All parts are completely enclosed to protect them from dirt and chips so there is no chance of failure.

This stop also is used as a jack for relocating the table over the bull wheel by inserting a handle in the stop and pumping the table back to its running position. No crane or other means, therefore, is required for this operation which invariably results in damage to the gear teeth.

After the stop is used it automatically resets itself. The operator or maintenance department does not have to replace any parts or reset any mechanism, thereby saving time and eliminating the human element.

HYPRO PLANER
Positive Hydraulic TABLE STOP

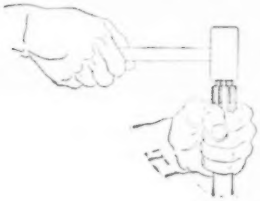


THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

Staples exclusive Expansion Reamers offer an *extra* plus that improves your quality and cuts operation time. It's diamond lapping . . . for the finer finish that means closer tolerances . . . quicker.

Closer TOLERANCES

AGAIN and AGAIN and AGAIN . . . *WITHOUT REGRINDING*



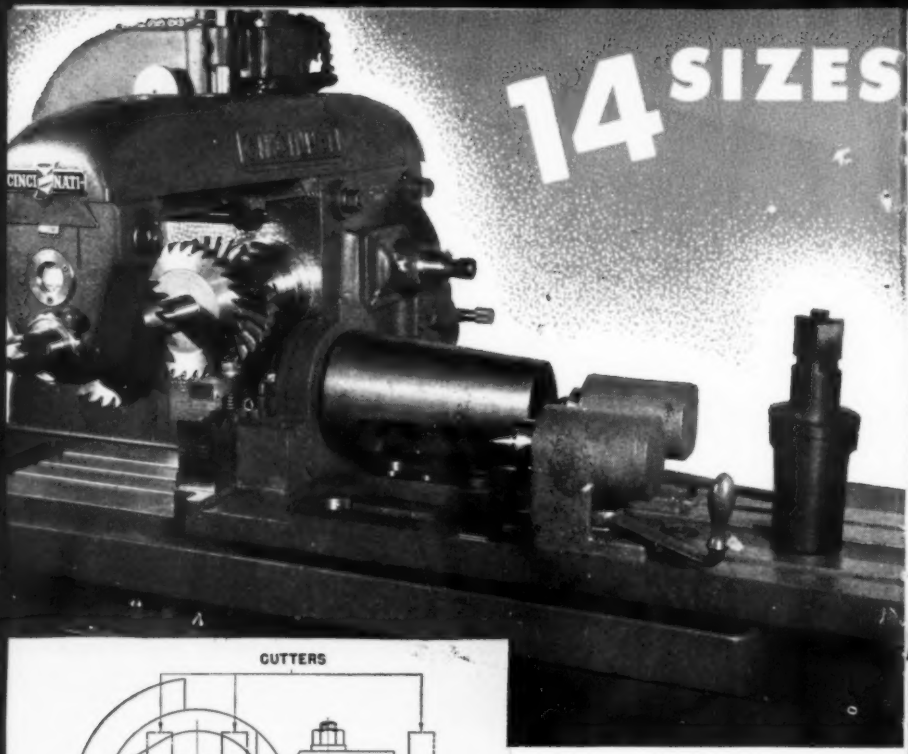
TO EXPAND . . .
JUST DRIVE IN
THE TAPERED PLUG

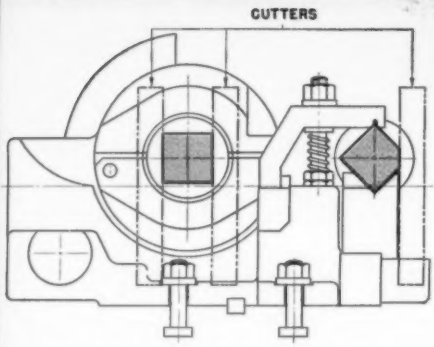
Use these better tools — the only ones with Carboloy tips that expand again and again and again without regrinding. Use them — to reduce your tool costs, obtain longer tool life and better hole finish.

Staples Tool & Engineering Co.
Cincinnati 25, Ohio

Staples **CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS**

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS





Sketch (end view) shows location of cutters and surfaces milled. Production . . . 25 parts per hour.

CINCINNATI No. 2-24 Automatic Rise and Fall Miller with equipment devised by Cincinnati Application Engineers to mill the wrench end of 14 sizes of valve plugs. The rise and fall feature takes care of squaring out the radius which would ordinarily be left by the cutters.

THE CINCINNATI

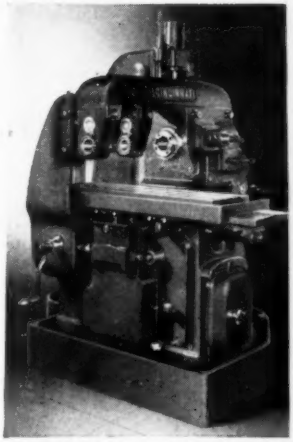
MILLING MACHINES

OF VALVE PLUGS milled with this equipment

HAVE YOU a family group of parts in your shop? If you do, perhaps they can be machined at much lower cost by merely devising one set of equipment to handle the whole family And manufacturing quantities of individual parts need not be exceptionally large to gain the greatest advantage through the use of automatic equipment.

The setup shown here illustrates what was done to reduce the cost of milling the wrench end of 14 sizes of valve plugs. A standard CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine was equipped with a two-station fixture and the proper cutters by Cincinnati Application Engineers. A square is milled on the part held in the inside station, and then it is transferred to the station next to the operator where one corner is milled off to form a five-sided shape. (See drawing) The entire cutting cycle proceeds automatically, started with the flip of a small starting lever To increase output still further, the inside station indexes automatically (to mill four sides of the square) through a hydraulic circuit.

The Application Engineers here at Cincinnati Milling will be glad to work with you on your machining problems, and to devise the best method and equipment for lowest cost production.



CINCINNATI No 2-24 Automatic Rise and Fall Miller. Catalog M-909-1 containing complete specifications, will be sent on request. Sweet's Catalog File for Mechanical Industries gives a brief description.

CINCINNATI

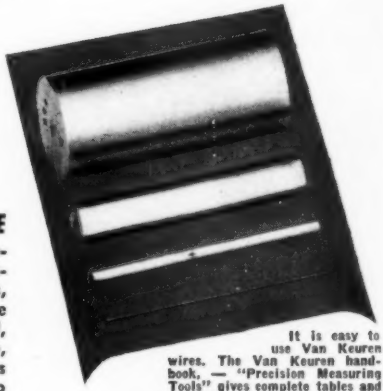
MILLING MACHINE CO.

CINCINNATI 9, OHIO U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Van Keuren

THREAD MEASURING WIRES



STANDARD EQUIPMENT EVERYWHERE

Van Keuren measuring wires are the accepted standard equipment for making measurements on thread gages, taps, worms, splines and spur gears. We carry a complete stock of sizes for measuring U. S. Standard, Whitworth, Metric, British Association, Pipe, Acme and 29° Worm threads. Special wires of any diameter in the range from .002" to 1.5708" are made to order. Our large supply of blanks insures prompt delivery.

Van Keuren thread measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter-century. They are accurate within .00002" for roundness and straightness and within ± .000025" for size. Special sizes are made to any tolerance required.

It is easy to use Van Keuren wires. The Van Keuren handbook, — "Precision Measuring Tools" gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable 160 page handbook No. 33.

THE Van Keuren CO. 175 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment—Light Wave Micrometers—Gage Blocks—Taper Insert Plug Gages—Wire Type Plug Gages—Measuring Wires — Thread Measuring Wires — Gear Measuring System — Shop Triangles.

DON'T MAKE TOOLS WALK TO WORK...

GIVE 'EM A RIDE!

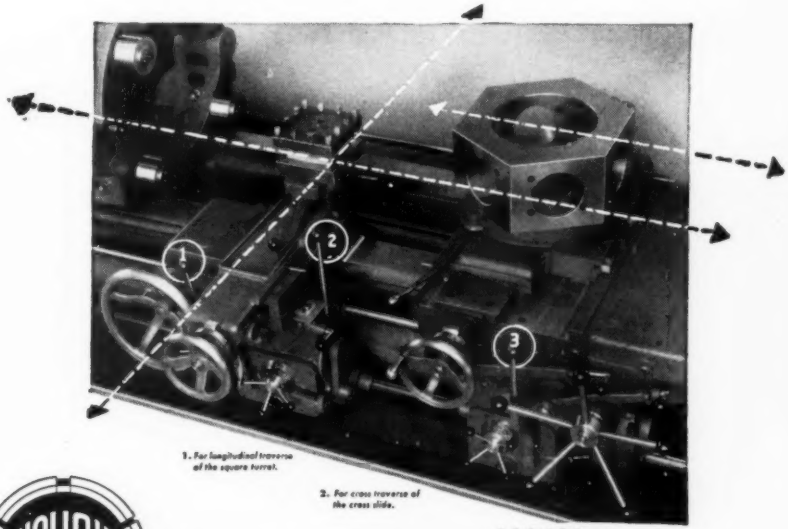
GISHOLT Standard—COMPLETE *Power Rapid Traverse* for ALL Saddle Type Turret Lathes

Here's another good reason why work goes faster on *all* sizes of Gisholt Saddle Type Turret Lathes.

There's longitudinal power rapid traverse for the hexagon turret carriage, of course. Furthermore, you'll find it provided for the longitudinal travel of the square turret carriage, and—an advantage pioneered by Gisholt—for transverse travel of the cross slide.

Quicker movement of tools in and out of cutting position reduces time between cuts. And it relieves the operator of laborious hand-turns—saves as much as one-third of his time on many jobs.

No wonder operators familiar with the *complete* traverse feature are strong for Gisholt. It helps them produce more, earn more, with less fatigue.



1. For longitudinal traverse of the square turret.

2. For cross traverse of the cross slide.

3. For longitudinal traverse of the hexagon turret.

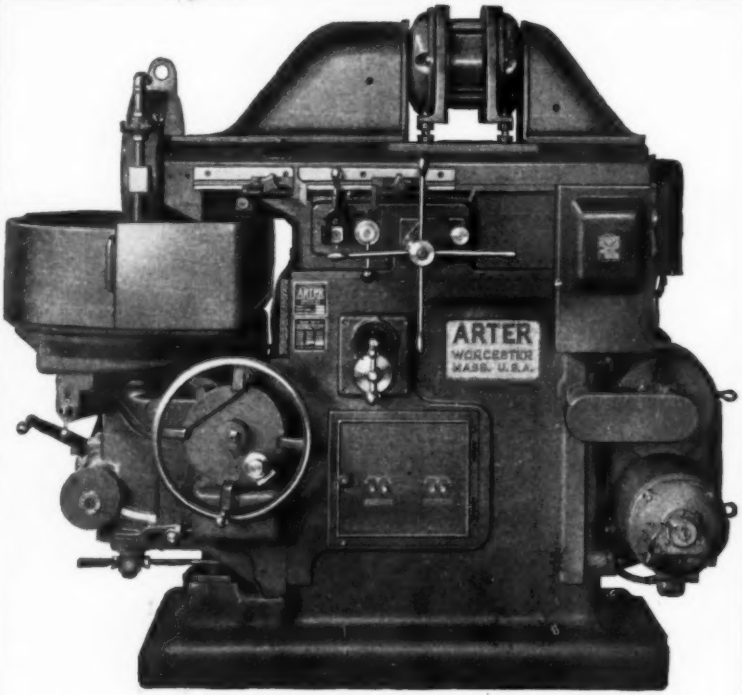
GISHOLT

GISHOLT MACHINE COMPANY

1185 East Washington Avenue • Madison 3, Wisconsin

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



Now Available!

ARTER Model D 12" and 16" Rotary Surface Grinders

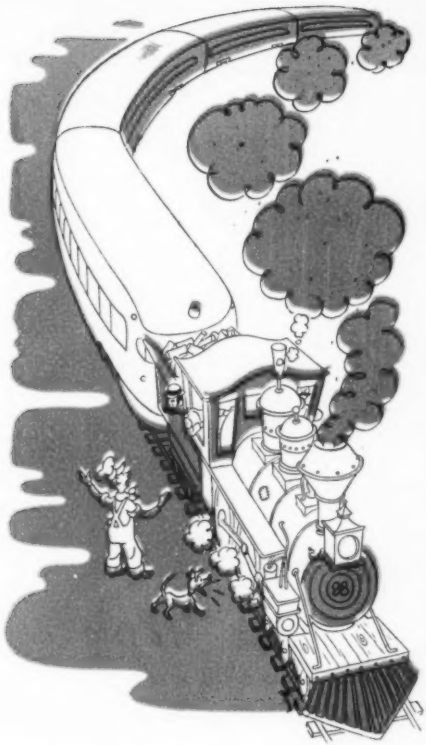
This outstanding advance, held back by war restrictions, is now generally available. Improvements and refinements insure work being ground to extreme precision and high finish to meet the exacting demands of industry today.

Wheel slide hydraulically operated, with piston rod and wheel spindle axis level with the longer, front extended, widened ways, gives smoothness to the traverse and stability to the spindle.

Chuck spindle mounted top and bottom in double-row, precision, preloaded ball bearings, driven by V belts from electric motor vari-speed drive unit.

ARTER GRINDING MACHINE CO.

WORCESTER, MASSACHUSETTS • U. S. A.



you wouldn't

hitch a modern train to an ancient locomotive

Nor would you put carbide cutting tools on a lathe that cannot transmit the power to use them at their maximum efficiency. Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

Jones & Lamson Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of carbide tools. They have the rigidity, they can transmit the power, they are easy to operate.

In the battle of costs to come, only those who use the most efficient tools and methods will survive. Now is the time to scrap your obsolete machines and replace them with good War Surplus machines or new machines. Phone now for one of our engineers to help you choose the equipment that will help you to win in the battle of costs to come.

What HORSEPOWER Are You Using?

Combined cuts like these, require as much as 300 per cent more horsepower with carbide tools than with high speed steel tools, but carbide halves the cutting time.

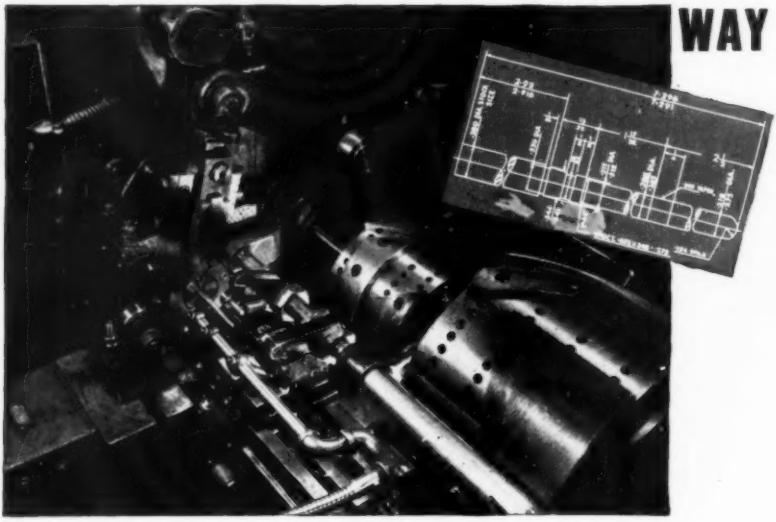
Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Turret Lathes

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

The CLEVELAND AUTOMATIC WAY



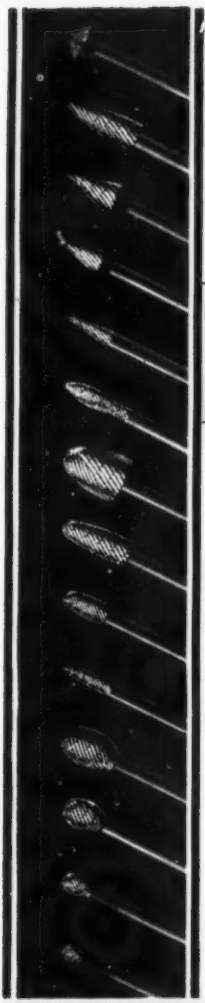
is the Low Cost Way

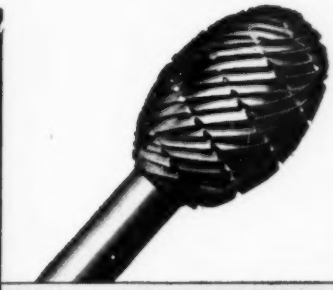
As in a majority of such jobs, the low-cost, high-production way to process the turntable shaft shown above was found to be the Cleveland way, with a Model B 1 1/16" single spindle machine set up for double gauging.

The stock is .380 Diameter SAE X-1112 ground bar. First gauge stop gauges 4⅝" of stock. Milling slide, mounted with multiple tooling and roller rests, turns the .275" diameter, .285" diameter and the .134" radius end. Work is steadied on roller rests in milling slide as circular forming tool on front cross slide forms four diameters and short taper in center of shaft. Stock is then fed to second gauge stop (7.291") and independent cut-off delivers finished shaft. This job is run at 2200 RPM. Gross output approaches three shafts per minute.

Remember . . . Clevelands Cut Costs

THE CLEVELAND AUTOMATIC MACHINE CO.
2277 Ashland Road · CLEVELAND 3, OHIO
BRANCHES: Chicago · Detroit · New York · Cincinnati · Hartford





JARVIS
ROTARY FILES

TUNGSTEN CARBIDE
GROUND from the SOLID

In line with the growing use of Tungsten Carbide tools, the Charles L. Jarvis Company has developed over the past few years a Ground-from-the-Solid Tungsten Carbide file which, from past experience, has proven to be extremely economical wherever standard High Speed Steel Ground-from-the-Solid Rotary Files are used.

It is possible to make extreme claims as to the life and cutting speed of these new type rotary files and experience has proven that if these tools are carefully salvaged for regrinding, the rotary file costs can be cut to a fraction of the High Speed Steel files.

Send For New Catalog

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS

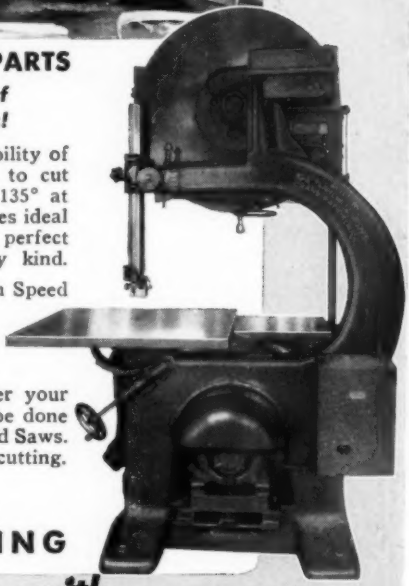
The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



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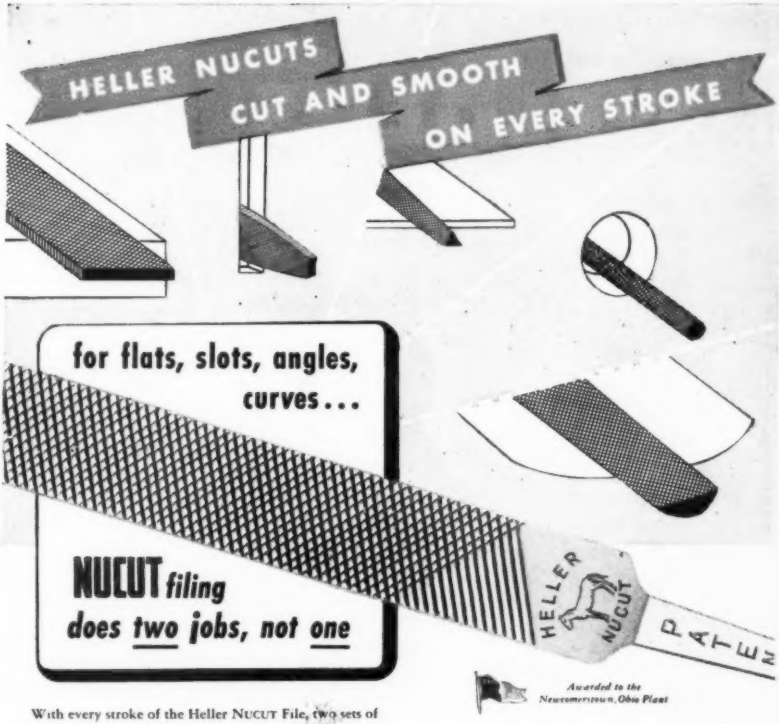
FRICTION SAWING

with **Tannewitz**

HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN



Awarded to the Newtomerstown, Ohio Plant

With every stroke of the Heller NUCUT File, two sets of teeth are working! One set of coarse teeth takes deep, clean, fast cuts, while the other set of fine teeth levels the surface smooth. Two jobs with every stroke!

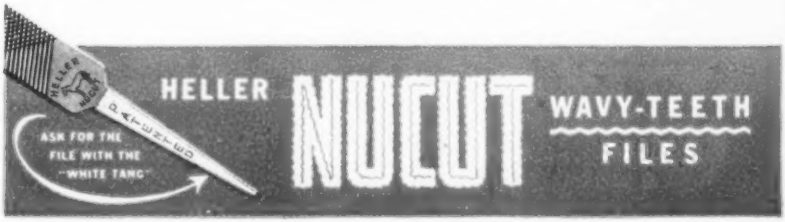
It is a patented Heller NUCUT feature that makes possible this cut-and-smooth, two-file filing. Scientific construction, with alternately increasing and decreasing space intervals between tooth rows—which identify the "Wavy Teeth" design—prevents chatter. The result is faster, easier filing without clogging, skidding or scraping

No matter what the filing job—slots, holes, flats or curved surfaces—and no matter what the material, from stainless steel, cast iron, lead, copper and aluminum to plastics, rubber or fibre, there is a Heller NUCUT to do your filing better!

HELLER BROTHERS COMPANY

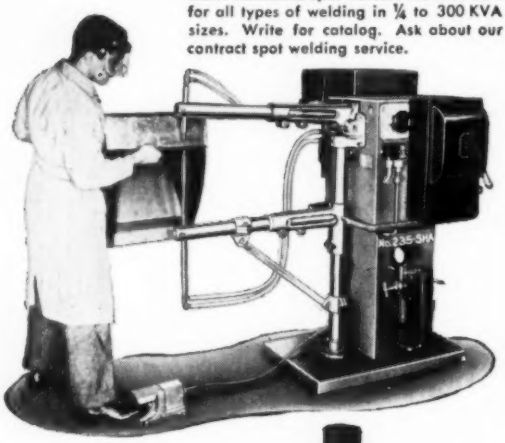
America's Oldest File Manufacturers — Good Tools Since 1836

Newark 4, New Jersey • Newtomerstown, Ohio



Spot · Butt · Arc
WELDERS

Eisler resistance spot welders are available for all types of welding in ¼ to 300 KVA sizes. Write for catalog. Ask about our contract spot welding service.



Ask for Eisler's latest catalog.

35KVA. Air operated. Slide Horn. Adjustable Arms. Weld Timer and Contractor. Excellent for universal applications.

75KVA. Multiple Press Type. Air operated. Weld Timer and Contractor.

Arc Welders
100 TO 400 AMPS.

Butt Welders

FOOT
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OPERATED

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Spot Welders
FOOT, AIR
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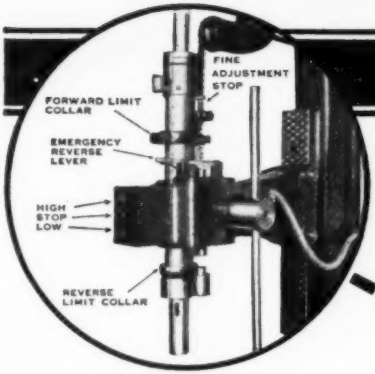
Chas. Eisler
Eisler ENGINEERING COMPANY
762 SO. 13th STREET NEWARK 3, NEW JERSEY



Avey FEATURE No. 1

THE Avey TYPE MA-6

AVEY-MATIC POWER FED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

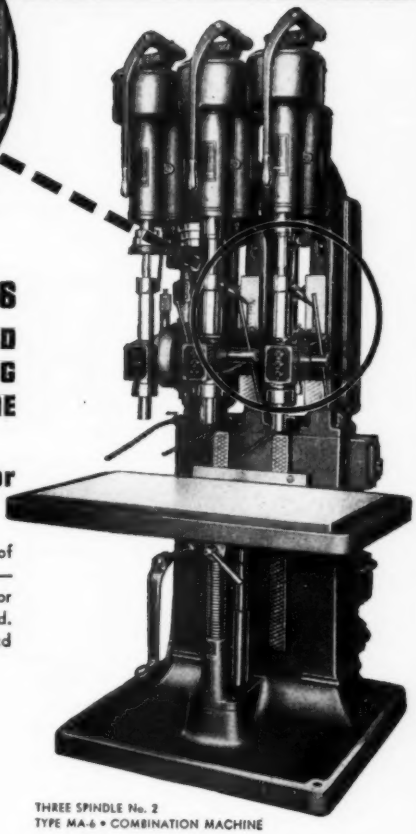
features

hand feed reversing motor for tapping

Dog control for depth — maintaining accuracy of depth within one-half revolution of the spindle — or emergency relief lever used to reverse motor if necessary before tapping cycle is completed. The natural motion of the spindle sleeve is used to control the reversing of the motor.

Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1¼" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

Avey DRILLING MACHINES

For FASTER PRECISION HONING....

FULMER HONING MACHINE

THE Fulmer Honing Machine produces round, straight, smooth bores to working tolerances as close as ±.0001".

Due to a wide range of spindle and reciprocating speeds, **it removes material faster than any other known method** for a comparable degree of accuracy and surface finish.

It is ideal for finishing aircraft, Diesel, gas and compressor cylinders; connecting rods; supercharger parts; landing gear struts; recoil cylinders—wherever superfine surfaces and extreme accuracy are required.

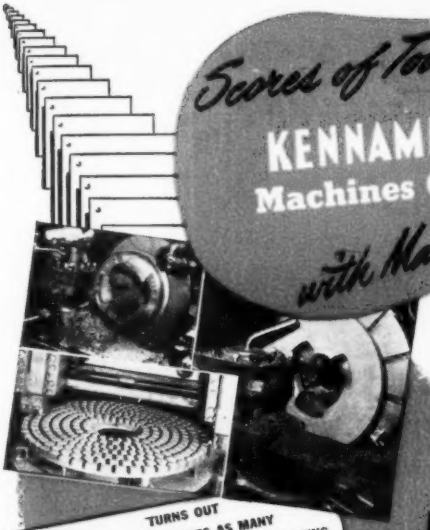
Cylinders of either small or large diameter can be honed on the Fulmer Honing Machine. Standard honing capacity is up to 20" inside diameter. Larger capacity on special order. Maximum stroke 72". Any conventional honing heads can be used. Write for complete information.

C. ALLEN FULMER COMPANY
1233 First National Bank Bldg., Cincinnati, Ohio

FULMER PRECISION PRODUCTION EQUIPMENT

ROD BORERS
HONING MACHINES
PISTON RING LAPPERS
CENTRIFUGAL CASTING MACHINES

DEALERS: *A few attractive territories remain open. Write today!*



Scores of Tough Jobs Prove

KENNAMETAL K6
Machines CAST IRON
with Maximum Economy

Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.

TURNS OUT 10 TIMES AS MANY PIECES, ON ROUGH CASTING, BETWEEN REGRINDS

One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation —turning outside diameter and facing both sides of hub and rim. Feed—.032". Depth of cut 1/16" to 3/8". SFM-280.

REMOVES TONS OF METAL FROM CHILLED CAST IRON PARTS, AT TOOL COST OF 7¢ PER TON

Style 12 Tool with K6 tip turns 1⅛ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21½" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375" Depth of cut—½". SFM-120.

CUTS 35 PIECES (on Abrasive Electric Iron) AS AGAINST 3 FOR CARBIDE PREVIOUSLY USED

This unique tool, tipped with Kennametal K6, turns out 11⅔ times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.

MULTIPLIES OUTPUT, ON FACING OPERATION, ON SANDY IRON CASTING

Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut —⅛" to 3/16". SFM-150 at start, 320 after tool entered cut.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this *new* and *improved* tungsten carbide—Kennametal Grade K6.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL *Inc.*, LATROBE, PA.

New Speed and Accuracy in Keyway Broaching

THE GLENNY
Adjustable • Expansion
PUSH BROACH

Maintains ± .0005" accuracy in every piece broached.

Broaches slots and keyways of greatest uniformity and accuracy to an average length of five inches and up to 5/8" widths. May be used on an arbor press, lathe, screw machine and other standard equipment. Has many valuable uses in shop and factory.

10 TIMES FASTER
than by ordinary methods

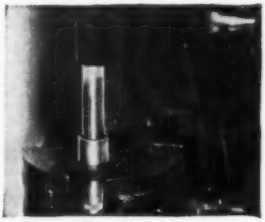
Actual tests in cutting keyways 3/16" deep, 3/8" wide, 1-1/2" I.D. and 3" long in a steel bushing proved ten times quicker than in handling the same operation on a shaper. Send for Bulletin 9. Learn more of this and other similar operations.

Send for Bulletin

Patent No. 2,184,383

Dept. A EAST SHORE MACH. PRODUCTS CO.

835 EAST 140th STREET • CLEVELAND 10, OHIO, U.S.A.



Glenny Broach in use on an Arbor Press.

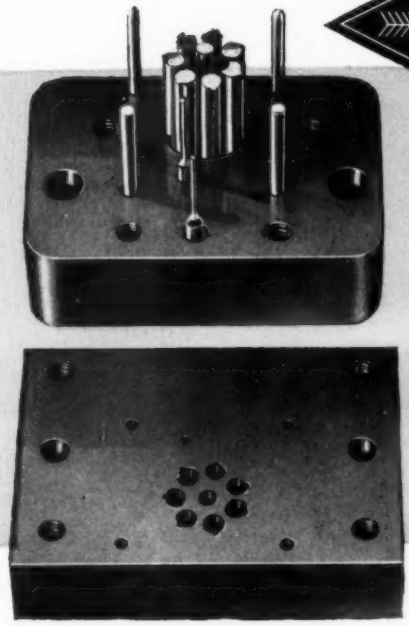
Glenny Broach in use on a Turret Lathe in series with other operations.

Today's Keynote—

PRODUCTION ECONOMY

Today's answer—

INVARO



These Invaro oil-hardening steel blanking dies are meeting a difficult requirement of close tolerance—held to .003 after heat treating . . . no tendency to shrink, warp or change dimensions. Uniform hardness and long life mean high production at low cost.

Look into Invaro for operations such as blanking, punching, forming, piercing, perforating, etc.

If YOU have a die steel problem—

Call Firth-Sterling STEEL COMPANY

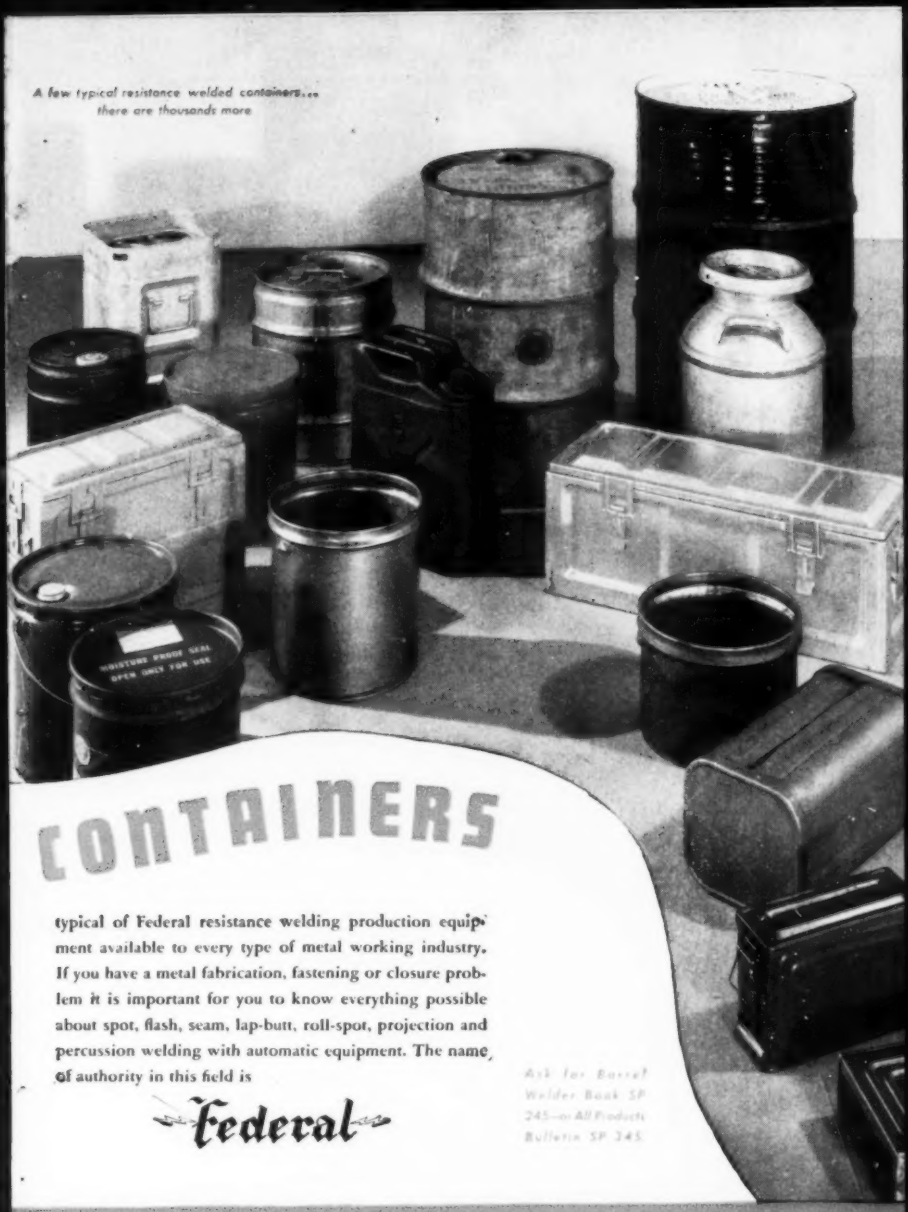
McKeesport, Pa. • New York • Hartford • Philadelphia • Pittsburgh • Cleveland • Dayton • Detroit • Chicago • Los Angeles

RESISTANCE WELDED

PRODUCED ON FEDERAL MACHINES

are better made . . . more rapidly made . . . at less cost. For instance, the Federal Flash Butt Barrel Welder shown in action above has produced profitably for more than ten years in a modern metal container plant where quality is a prime requirement, along with high production. It delivers 2,500 steel 55-gallon drums daily, and is

Federal MACHINE



CONTAINERS

typical of Federal resistance welding production equipment available to every type of metal working industry. If you have a metal fabrication, fastening or closure problem it is important for you to know everything possible about spot, flash, seam, lap-butt, roll-spot, projection and percussion welding with automatic equipment. The name of authority in this field is

Federal

Ask for Barrel Welder Book SP 245—or All Products Bulletin SP 245

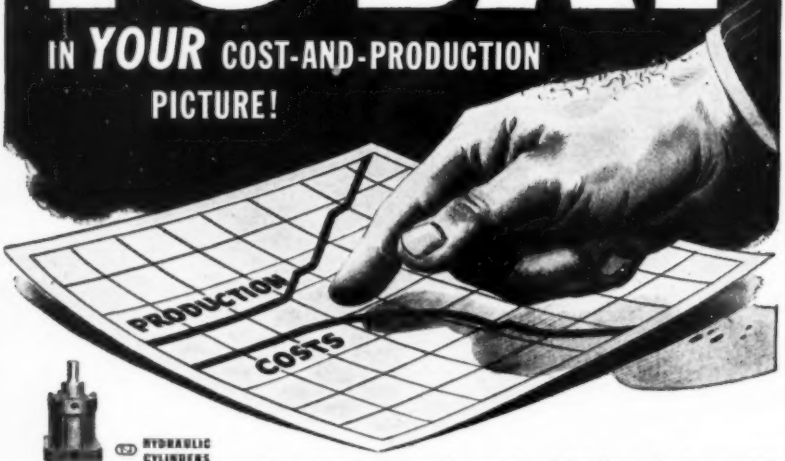
AND WELDER COMPANY

216 DANA STREET
WARREN, OHIO

Easy to Find

T-J DAY

IN *YOUR* COST-AND-PRODUCTION PICTURE!



T-J HYDRAULIC CYLINDERS

T-J AIR CYLINDERS

T-J CUTTERS

T-J AIR CONTROLS

T-J RIVITORS

T-J CLINCHORS

It's an important day when you install T-J Products—because T-J Performance invariably means a *better job*... sending your costs down and production UP!

For more than a quarter of a century, plant men throughout industry have found T-J *unbeatable* for Tough Jobs! Whether it's air cylinders... hydraulic cylinders... Rivitors... cutters... Clinchors... or air controls... you can trust T-J to do the job *right!* T-J engineering know-how and precision manufacture give to all T-J products a proud heritage of *accuracy, efficiency* and *dependability.* Write for bulletins.

The Tomkins-Johnson Co., Jackson, Michigan.

FOR TOUGH JOBS SPECIFY

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

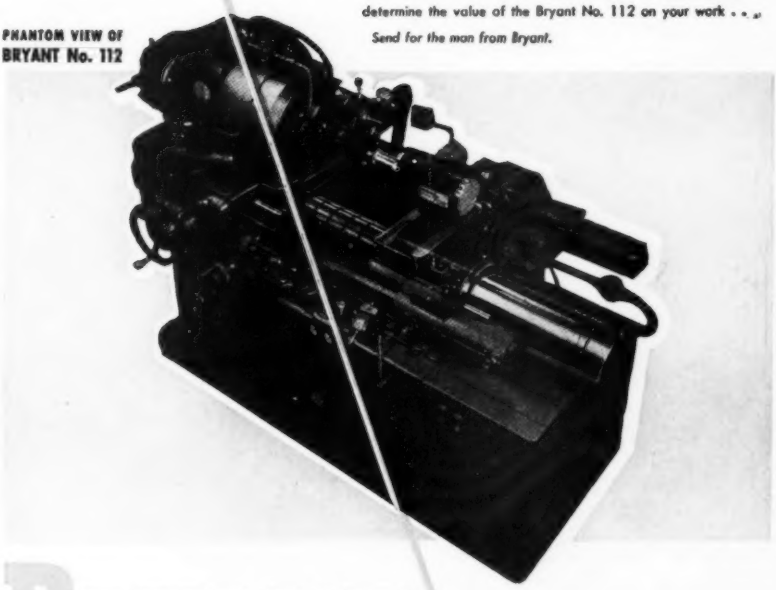
T-J

We have reversed the design . . . but NOT the principle

Users agree that the Bryant principle of *cylindrical slide construction* is ideal for the fast, precise, economical production of internally ground parts. Bryant engineers knew that this same principle, applied *under the work head*, would be more practical for certain types of jobs. The result was the Bryant No. 112. This result has been *tested and proved* for the past five years.

The No. 112 is the last word for the internal grinding of tool room and small lot parts. It is designed with simple, concentrated controls — tooling and fixtures may be changed quickly — production is extremely fast — accuracy and work finish are among the finest ever produced by any grinder of any type. To help determine the value of the Bryant No. 112 on your work . . . *Send for the man from Bryant.*

PHANTOM VIEW OF
BRYANT No. 112

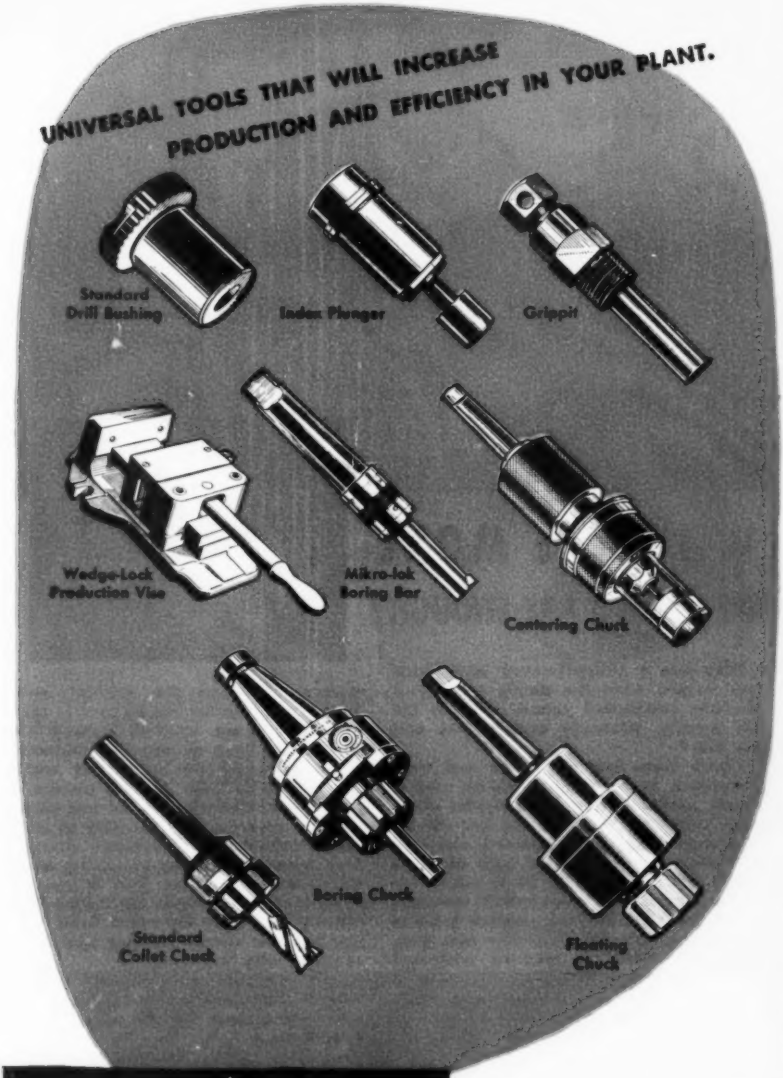


BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

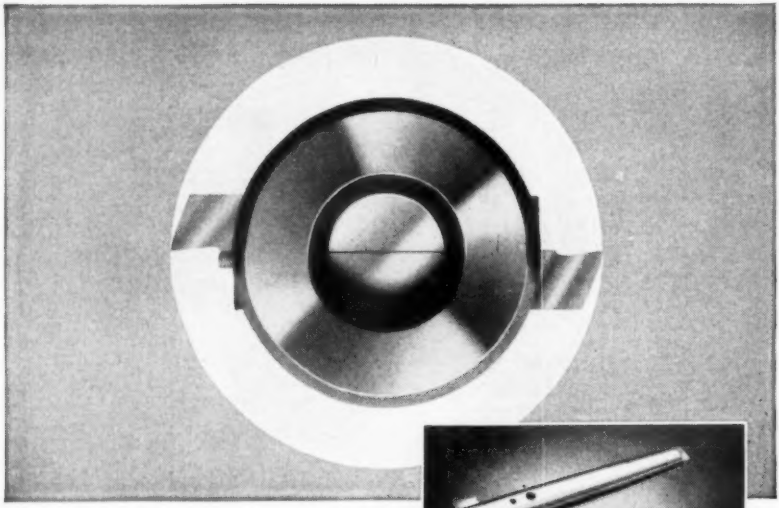
Reduce WORK CHANGE TIME FROM 10% TO 80%

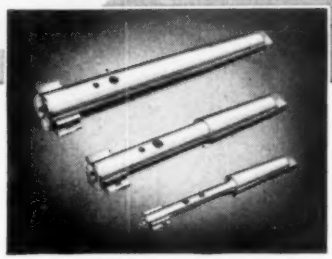
SWIFT LOCKING, POSITIVE GRIP OF NEW UNIVERSAL WEDGE-LOCK VISE SIMPLIFIES SMALL PARTS PRODUCTION

It's a whiz! Just a short 15 degree pull on the lever clamps work in the Universal Wedge-Lock Production Vise. A second pull of only 7 degrees locks the piece securely, ready for machining. Taper wedges smoothly and swiftly apply pressure to adjustable jaw—reduce loading and unloading time from 10% to 80%. Available in 4", 5", and 6" jaw widths. Write for complete information on Universal Wedge-Lock Vises and other superior Universal tools illustrated.



UNIVERSAL ENGINEERING CO. **FRANKENMUTH, MICHIGAN**





WHY USE MORE
WHEN TWO ARE ENOUGH?

Why use a complicated multi-blade type reamer when the simply constructed Madison two-bladed reamer will do the job quickly, efficiently and at less cost per hole?

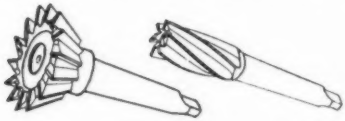
Check these features in the end view illustration of a Madison shown above: Cooler cutting because two blades allow more room for chip clearance and circulation of coolant. This eliminates shrinking or tapering of the finished hole and cuts costly rejects and scrap. Freer cutting action permits more speed and a sustained production job. Madison reamers produce a mirror-smooth finish in one operation, often eliminating the need for additional finishing. Because Madisons are pre-sized, they are easily interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. Thus, a sharp cutter can be kept in operation at all times, assuring uniform work and the holding of required tolerances. Madison's one-screw adjustment feature, which controls both blades, permits expansion to make up for wear and regrinding and prevents the possibility of an off-center adjustment. Madison's controlled float feature eliminates possibility of misalignment errors, since float is controlled right at the point where the cutting action takes place. Only the cutter floats — not the bar. No special floating tool holders required with Madisons.

To better solve your reaming problems and to attain rock-bottom cutting costs — specify Madisons for all future reaming operations.

MADISON MANUFACTURING COMPANY
DEPT. B-5 MUSKEGON, MICHIGAN

Yours CUTTER GRIND FOR *Production!*

Grinds Difficult Cutters Easily



New in principle, the ACE is already old in experience in hundreds of plants. We recommend it for grinding face mills up to 15" . . . slitting saws . . . mill ends . . . angular cutters . . . slab mills . . . dovetail cutters . . . reamers . . . taper reamers . . . gear cutters . . . double angle cutters. Fellows helical cutters . . . production gashing . . . radial relief grinding . . . and newer uses found every day.

Easy to operate the ACE . . . keeps the work before the eye with no bending . . . no squatting . . . no squinting . . . saves the operator from work fatigue.

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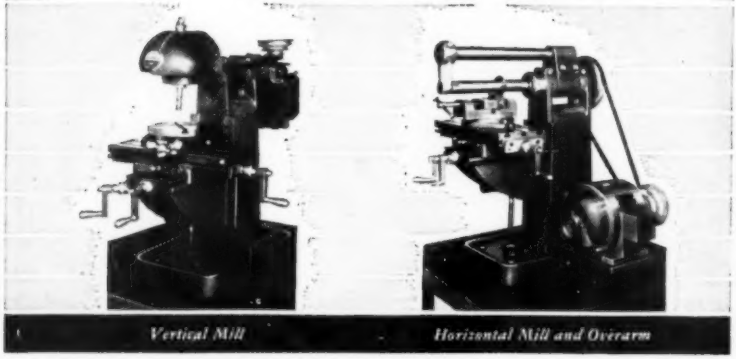
Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS FACE MILL GRINDERS DIEMAKING MACHINES

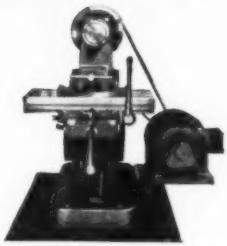
ONE BENCH MACHINE FOR *BOTH* HORIZONTAL and VERTICAL MILLING



Vertical Mill — *Horizontal Mill and Overarm*

FOR PRECISION TOOL WORK OR HIGH-SPEED PRODUCTION

benchmaster—offers a bench milling machine easily convertible from a conventional horizontal to a vertical miller by simply interchanging the spindle attachments.



Production Mill with Rack and Pinion Feed

ACCURATE • VERSATILE • LOW PRICED

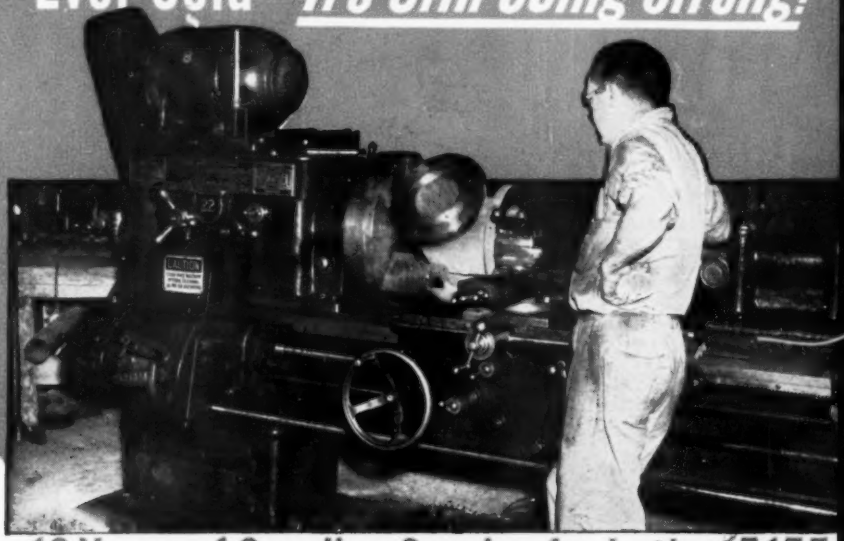
SPECIFICATIONS: Table size—6" x 14"—Three Tee slots ⅜", 2" center • Longitudinal travel 8½" • Traverse travel 5½" • Vertical travel 8½" on vertical mill—9½" horizontal mill • Height 28" • Weight (less motor) 215 lbs. • Requires 1/3 h. p. motor • Spindle speeds (standard 1725 rpm motor) 450-850-1400-2100 rpm.

benchmaster tools — LOS ANGELES, CALIFORNIA

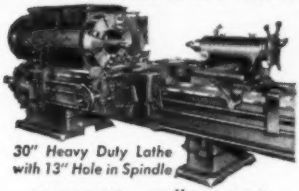
benchmaster manufacturing company

2952 w. pico, los angeles 6, cal.

Here's the FIRST Hydratrol Lathe Ever Sold — *It's Still Going Strong!*



10 Years of Grueling Service for Lathe #5155



30" Heavy Duty Lathe with 13" Hole in Spindle

5 SIZES—18" to 36"

Small	18" up to 7½"	Hole
Medium	24" up to 12"	Hole
Large	27" up to 13"	Hole
Large	30" up to 14"	Hole
Large	36" up to 16½"	Hole

(Standard type lathes, 16" to 36")

THIS HYDRATROL LATHE was used by the original purchaser 9 years, most of that time 24 hours a day, 7 days a week. During this period the purchaser bought and used $700,000.00 of HYDRATROL LATHES!

Having a surplus of this particular size, the owner sold Lathe #5155 in 1944, to the Corpus Christi Machine Shop, Corpus Christi, Texas, in whose shop the above photo was taken.

The new owner recently wrote us: "Hydratrol Lathe #5155 has given excellent service, and has never given any trouble. It is rugged enough to handle heavy work and still maintain the extreme accuracy originally built into the machine."

LEHMANN MACHINE CO., St. Louis 3, Mo.

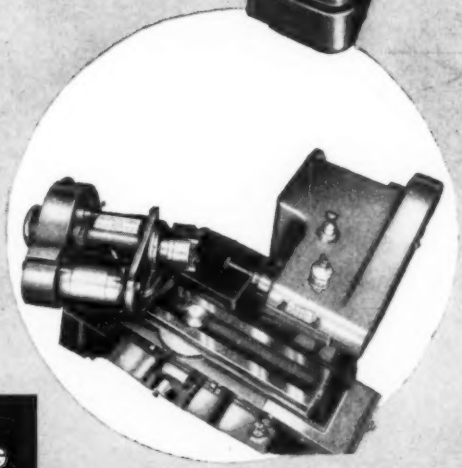
HYDRATROL LATHES*

*LARGE HOLLOW SPINDLE TYPE

GRENBY HYDRAULIC GRINDING MACHINES

FEATURES

- Infinitely Variable Longitudinal Traverse
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)



EG103 SPECIFICATIONS

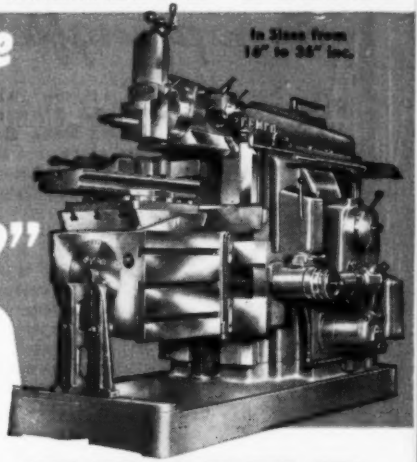
Work Capacity—3" Dia. x 10" Length
Workhead Accommodates—Collets 1" Max. Hole
—Chucks & Face Plates 4" Max.
Floor Space & Wt. 45" Leng x 25 Wide—1600 lbs.

THE GRENBY MANUFACTURING COMPANY

PLAINVILLE, CONNECTICUT

We Asked Several Hundred Users:

"What Do You Like Most About GEMCO Shapers?"



Here Are the 10 Most Popular Features and Advantages:

1. "Rugged, rigid and accurate, giving work a precision finish."
2. "Lubrigard Safety Device."
3. "Wide range of feeds and speeds; saves time and tools."
4. "Power rapid traverse a time saver."
5. "Our operators and tool-makers enthusiastic in general."
6. "Universal table is big, useful, time-saving."
7. "Quiet, smooth-running, easily adjusted, easy to operate."
8. "Centralized Controls."
9. "No breakdowns, small maintenance cost."
10. "Time-saving, resulting in lower production costs."

GEMCO

Multi-Purpose SHAPERS

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BULLETIN GC-12B

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ENGINEERING & MFG. CO.
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MANUFACTURERS OF
PRECISION MACHINERY
SINCE 1917

THE *Springfield* PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

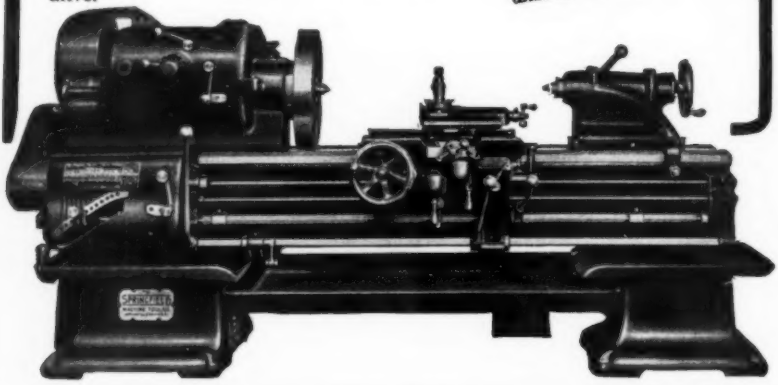
Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and ways are oiled from one well.

Regular equipment includes large and small face plates, tool posts, steady rests and all necessary wrenches. Motors are located in large cabinet leg under head stock connected to machine by either V belts or silent chain drive.

BUILT TO GIVE MAXIMUM VALUE

SEND TODAY FOR BULLETIN No. 161

Tells the why and how of Springfield's accurate production.

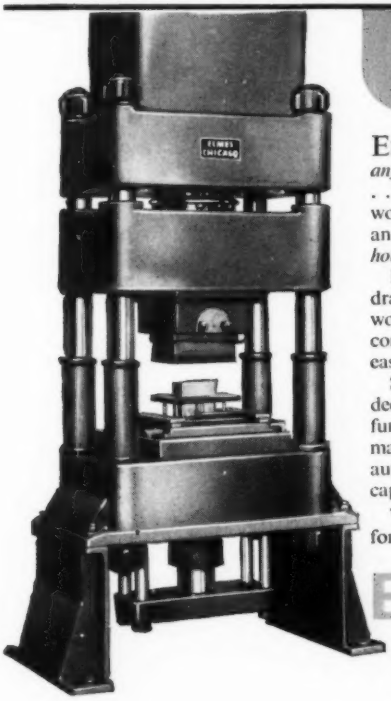


THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

DRAWING FORMING

Hydraulic Presses Are Ideal for Metal Working



Single-action Elmes column-type drawing and forming press with hydro-pneumatic draw cushion in press bed—Model No. 4716. Elmes draw cushions can be furnished on either single or double-action presses to approximate or supplement blankholder functions. Shop air pressure is not required after charging at time of installation.

Elmes hydraulic presses give you full power at *any point* in the stroke, for starting deep draws . . . slide speed you can vary at will for fast work *without* tearing blanks . . . selective travel and rapid traverse that save seconds, minutes, *hours*.

Instant response to sensitive control—*precise* drawing pressures—variable dwell upon the work—elimination of needless movement, *all* contribute to modern Elmes efficiency that is easy on dies, yet gets things done in a hurry.

Single-action presses for shallow draws, and deep-draw, double-action designs, both can be furnished with Elmes simplified controls in manual or quickly set semi-automatic or full-automatic types. Press sizes, arrangements, capacities, cover *all* service needs.

Write for Bulletin 1010A, "Hydraulic Presses for Drawing, Forming Metal."

ELMES HYDRAULIC EQUIPMENT

PUT YOUR PRESSING PROBLEMS UP TO ELMES, NOW!

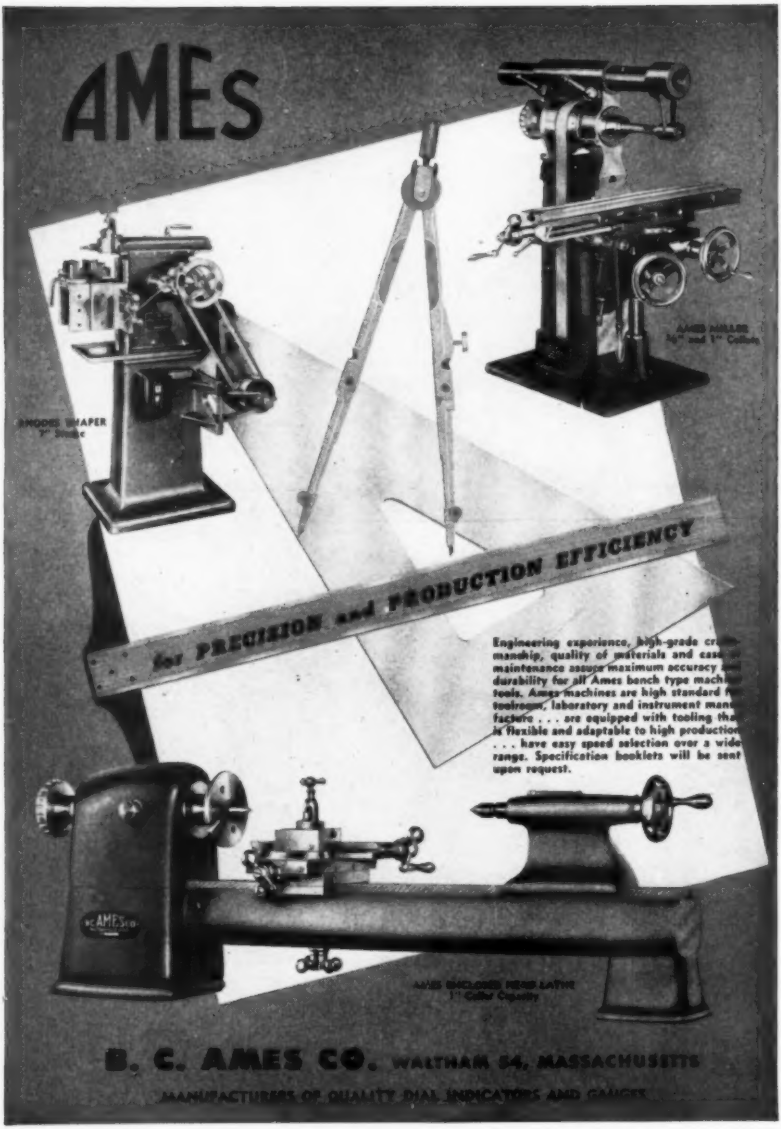
Elmes hydraulic equipment also includes presses for forcing, forging, hobbing, straightening, extruding, plastics molding; laboratory presses; hydraulic accumulators; high-pressure pumps.

Whatever the job, you can have dependable Elmes presses that meet your needs *exactly*. Elmes experience is yours for the asking. Write today.

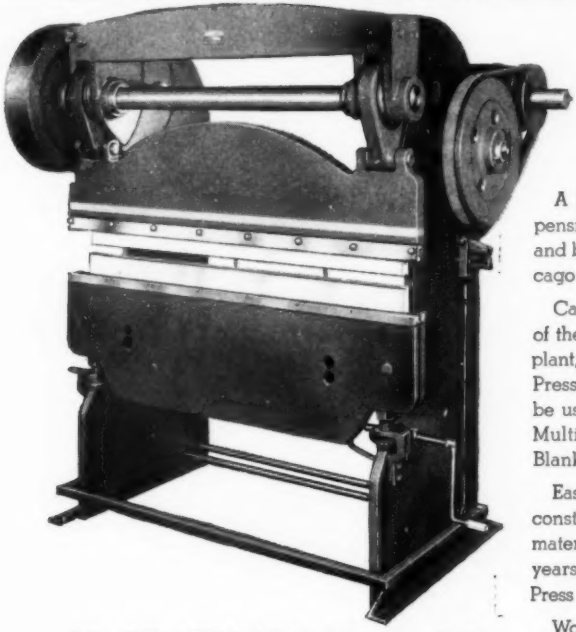
ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 244 N. Morgan St., Chicago 7, Ill.

Also Manufactured in Canada

METAL WORKING PRESSES · PLASTIC MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES


AMEs
for PRECISION and PRODUCTION EFFICIENCY
Engineering experience, high-grade craftsmanship, quality of materials and ease of maintenance assure maximum accuracy and durability for all Ames bench type machine tools. Ames machines are high standard for toolroom, laboratory and instrument manufacture . . . are equipped with tooling that is flexible and adaptable to high production . . . have easy speed selection over a wide range. Specification booklets will be sent upon request.
B. C. AMES CO. WALTHAM 54, MASSACHUSETTS
MANUFACTURERS OF QUALITY DIAL INDICATORS AND GAUGES

Powerful CHICAGO STEEL PRESS BRAKE



NEW TYPE "300"

A POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

Can handle 40 to 50 percent of the work done in the average plant, thereby releasing the larger Presses for heavier work. Can be used for Forming Embossing-Multiple Punching, Notching, Blanking, etc.

Easy of operation, accurate and constructed of highest quality material and backed by over 45 years experience building Steel Press Brakes and Bending Brakes.

World's largest manufacturer of Steel Hand Bending, Power Bending and Power Press Brakes —write for New Bulletins 42 PR and 44 H and complete New Die Book—"Forming Press Dies and Their Uses."

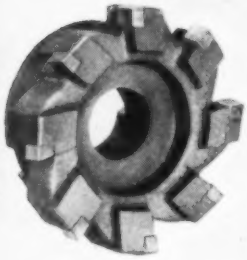
A Small Steel Welded Construction Press Brake a brute for punishment and a prodigious worker for the Sheet Metal Plant—

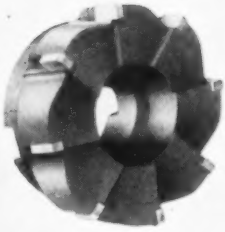
—3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by 1½ h. p. motor.

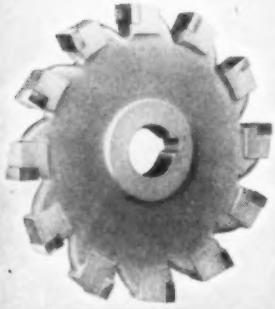
DREIS & KRUMP MANUFACTURING CO.

7440 LOOMIS BLVD. . . CHICAGO 36, ILLINOIS

Here's NEWS!







Now you can get Cooper-Bessemer Meehanite Milling Cutters

tipped with carbide . . . ready to use!

Introduced three years ago, Cooper-Bessemer milling cutter bodies cast of Meehanite Metal have demonstrated their outright superiority to hundreds of manufacturers equipped to do their own tipping. Now, Cooper-Bessemer face mills, shell end mills, and side mills are available in finished form . . . tipped with carbide . . . ready to do the cleanest cutting job you've ever seen — and fast!

Yes, clean and fast, because Meehanite has twice the damping capacity of steel, absorbs vibration, prevents tool chatter, and dissipates heat more rapidly. Naturally speeds and feeds can be increased, and tips last longer. The net result is always the same . . . better finished work at lower cost.

Cooper-Bessemer carbide tipped milling cutters comprise a complete standard line in a full range of sizes, either right or left hand, and in different designs for cutting iron, steel, plastics, and all non-ferrous metals.

Send for free bulletin No. 100-TC. It lists all the milling cutters, specifies uses, gives complete dimensions, specifications, and prices.

THE Cooper-Bessemer CORPORATION
Industrial Tool Division
Dept. R, Mount Vernon, Ohio

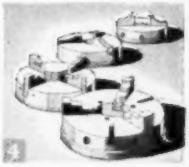
COOPER-BESSEMERS CUT THE COST OF CUTTING

First you've gotta know what a chuck is

Chucks hold tools or work that are in motion.

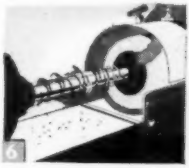
Chucks owe their origin to the ancient potter's wheel.

First chucks were used for making cannon in War of 1812.

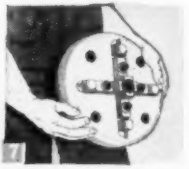


There are many kinds of chucks. Here are some in common use.

Many chucks are too "slow" for modern high-speed production.

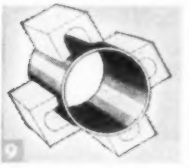


Other chucks aren't positively true—lack hair-splitting accuracy.

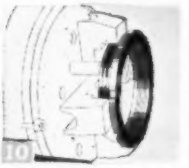


New and better is the amazing Woodworth Diaphragm Chuck.

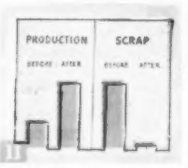
Jaws fasten to diaphragm which flexes like bottom of oil can.



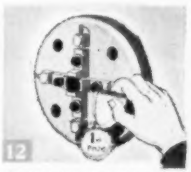
Thin-walled parts won't distort in machining to close accuracy.



Large, heavy parts can be processed with fine precision.



Steps up production 2¼ times — scrap practically eliminated!



A winner! Industry acclaims Woodworth Diaphragm Chuck!

What Woodworth Products Mean to Industry

THE DIAPHRAGM chuck is a typical Woodworth contribution to mass production efficiency. Here's why.

Every Woodworth product must conform to the basic policy of this company—*TO MAKE ONLY PRODUCTS WHICH WILL BENEFIT INDUSTRY THROUGH INCREASED PRODUCTION AND REDUCED COSTS.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth Products of the future.

The constant growth of the N. A. Woodworth Company is due to strict adherence to these objectives.

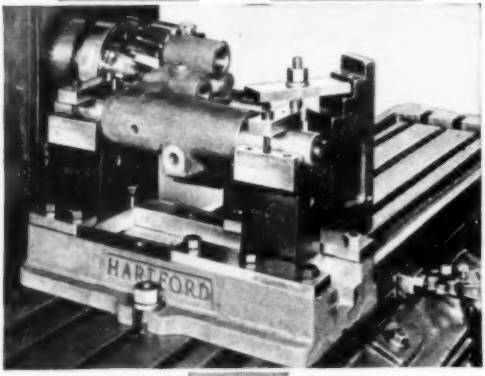
ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION
1300 E. NINE MILE ROAD
DETROIT 20, MICHIGAN

PRECISION GAGES
PRECISION MACHINED PARTS
PRECISION TOOLS

The HARTFORD V-BLOCK FIXTURE Saves Time on MILLING BORING and INSPECTION SET-UPS



Descriptive **BULLETIN** *sent on request*

A wide variety of irregularly shaped work can be located and held advantageously with this versatile V-Block Fixture. It provides a rapid, accurate and simplified method of setting up work for milling, boring, drilling, inspection, etc.

The fixture is 15⅞" in overall length; overall width is 9¼"; height to top of V-Block is 7⅝"; maximum arbor diameter is 2¼"; maximum distance between V-Blocks 10"; net weight is 80 lbs. and shipping weight approximately 100 lbs.

Hartford V-Block Fixtures expedite the handling of tough set-ups and will prove a worthy investment for any machine shop.

THE HARTFORD Special Machinery Co.

HARTFORD 5, CONN.

HOW TO TURN OUT CARBIDE-TIPPED TOOLS IN A HURRY!

HANDY FLUX
is fully fluid and active at a temperature below the flow point of EASY-FLO No. 3. By using it, you get the full economy resulting from the low working temperature of EASY-FLO No. 3.

By brazing with the low-temperature silver alloy

EASY-FLO NO. 3

you can get any tool tipping production you need. The illustration shows how one manufacturer does it—with a low-cost set-up that turns out tipped tools in a steady stream.

Shanks and tips are cleaned with carbon tetrachloride. Shanks are then clamped in the simple "homemade" jig held in the bench vise. HANDY FLUX is liberally applied. Pieces of EASY-FLO No. 3 sheet stock, cut to size, are placed in the shank recesses. Carbon tips are put in position. The operator then goes down the line applying heat below each shank, using the rod to position the tip as the alloy melts and to hold it a few seconds after heating is finished. Finally the brazed tools are placed in lime boxes below the bench for slow cooling. Hundreds of carbide tipped tool users are now doing their tipping the EASY-FLO NO. 3 brazing way—the method recommended by leading producers of carbide tips. You, too, will find it pays to use this fast, reliable, low-cost method.

BULLETIN 11-A GIVES FULL DETAILS about the EASY-FLO No. 3 brazing method with step-by-step instructions. Write for a copy now.

ARMY NAVY

HANDY & HARMAN

HANDY & HARMAN FOUNDED 1867 QUALITY & SERVICE

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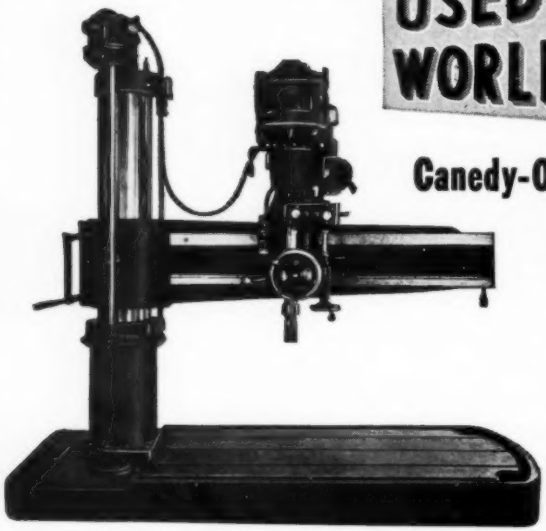


USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

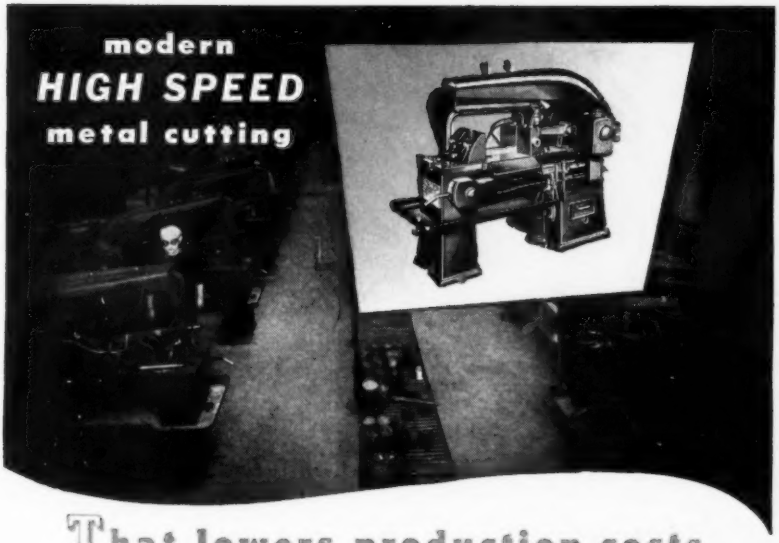
Early delivery possible.

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3"	4"	5"
Greatest distance from spindle to base	43"	48"	48"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	88"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILLINOIS



That lowers production costs

Here is modern high speed metal cutting—with greatest efficiency —at the start of a great production line. This battery of Racine heavy duty Hydraulic metal cutting Machines in a prominent midwestern steel mill, is speeding up the plant capacity.

These smooth, powerful hydraulic Machines save time and material. Their accuracy reduces the cost of subsequent machining operations—all factors in helping you meet the post war need for maximum efficiency, increased output, lower costs.

A complete series of Machines from 6" x 6" to 20" x 20". Get our catalog No. 12. Also ask for Free production estimates on your specific work. Write today.

RACINE OIL HYDRAULIC PUMPS AND VALVES

Consider Racine *Variable Volume* Pumps and Racine Valves for your oil hydraulic circuits. Pump 0 to 30 G.P.M. Operating pressures 50 to 1000 lbs. p.s.i. Valves in all sizes from ⅜" to 1½" I.P.S. Full information in our catalog P-10-C. Write.

RACINE TOOL AND MACHINE CO., 1754 State St., Racine, Wis.

RACINE

Standard for Quality and Precision

You ARE interested in getting maximum life and accuracy from your taps... the BLAKE TAP GRINDER, will get it

No machine is better than the cutting edge of the tool it uses.

Please send me bulletin 544 which gives complete details on Blake Tap Grinders.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

H.

EDWARD BLAKE CO.
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—
BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

YOU WILL NOW FIND THIS MARK
ETCHED ON ALL THESE FINE PRODUCTION TOOLS
FOR CUTTING METAL, WOOD, PAPER, PLASTICS

From now on, all Simonds Saws for cutting wood, metal, and plastics... all Simonds Machine Knives for cutting wood, veneer, and paper... all Simonds Red Tang Files... all Simonds steel and steel specialties... *every one* of these first-quality products will bear the same mark of family-identity you see above. And a like mark will also identify the products of Simonds Abrasive Company of Philadelphia (formerly the Abrasive Company), of Simonds Canada Saw Company, and of Simonds Steel Mills at Lockport, New York.

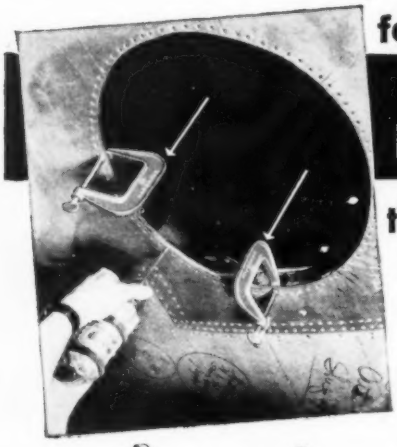
So now, when you want fine tools for cutting and grinding, this ribbon-etch... signature of America's longest experienced firm of sawmakers... tells you at a glance: "There's no finer tool made in this line... *anywhere.*"

SIMONDS rhymes with diamonds

...and Simonds Tools cut with diamond-like smoothness and precision. Order from your Industrial Supply Distributor or dealer, or write the nearest Simonds office:

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 51 W. Trent Ave., Spokane 8, Washington.
Canadian Factory: 595 St. Remi St., Montreal 30, Que.

On Your Tools - *Look* for the NAME



HARGRAVE

the MARK of QUALITY for 66 years

The superior performance of HARGRAVE Clamps, Chisels, Punches, etc., are the result of 66 years of specialized experience in producing fine mechanic's hand tools. Year after year these tools prove better—because they are instantly improved to meet changing needs of industry. That's why skilled mechanics look first for the name HARGRAVE.

WRITE FOR CATALOG

showing the complete line of HARGRAVE Clamps, Chisels, Punches, Washer Cutters, File Cleaners, Brace Wrenches, etc.

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

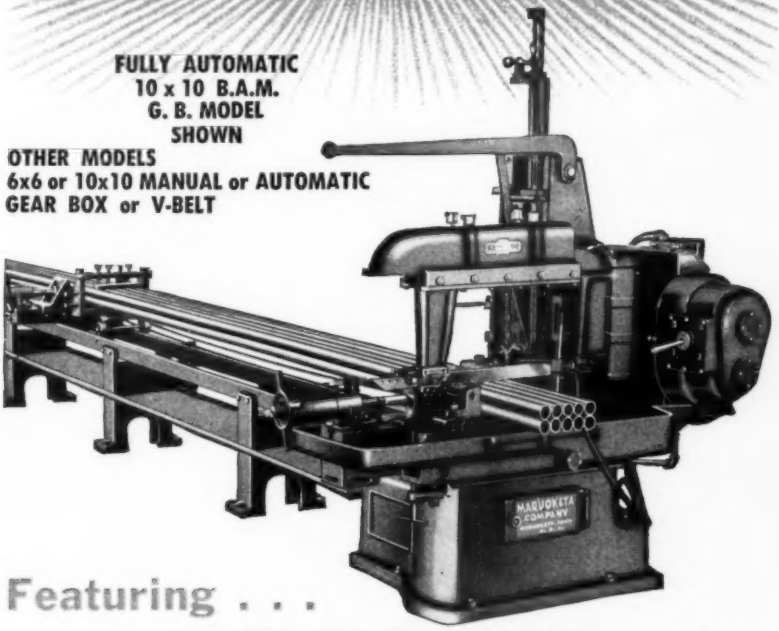
THE CINCINNATI TOOL CO.
1945 Waverly Ave., Cincinnati 12, Ohio

The CINCINNATI TOOL Co.

Saw More
METAL CUTTING MACHINES

FULLY AUTOMATIC
10 x 10 B.A.M.
G. B. MODEL
SHOWN

OTHER MODELS
6x6 or 10x10 MANUAL or AUTOMATIC
GEAR BOX or V-BELT

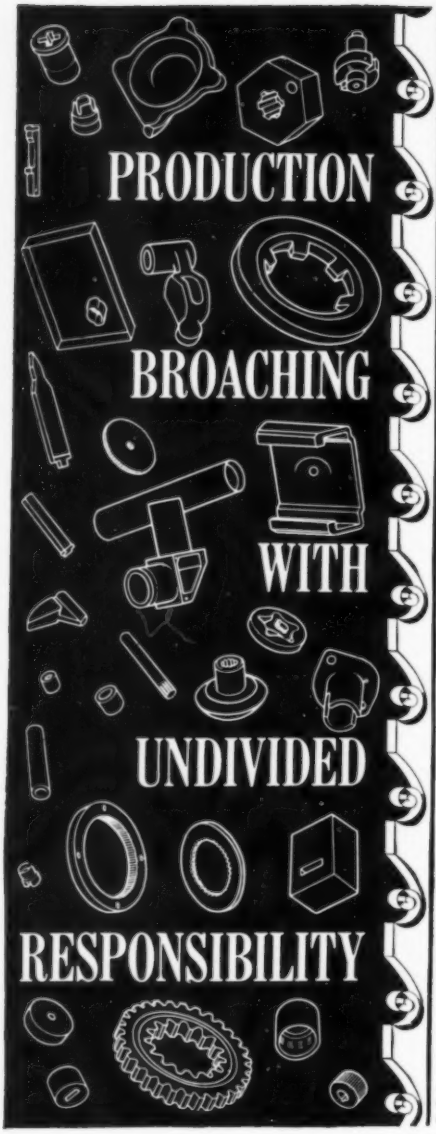


Featuring . . .

FOUR SPEED GEAR BOX TRANSMISSION
SPEEDS OF 65, 93, 120 AND 149 S.P.M.
ALL MACHINES SWIVEL ON BASE TO 45°
FOR ANGLE CUTTING

WRITE FOR SPECIFICATIONS

MAQUOKETA COMPANY
MAQUOKETA, IOWA



THE largest plant of its kind in the world is ready now. Michigan has a new and completely equipped plant for *diversified commercial Broaching.* When BROACHING is indicated in your postwar "Processing" don't substitute costly machining methods.

If you don't have equipment.
If your equipment is filled up.
If in a hurry to get started.
If you have complicated jobs.
If runs are too short to tool up.

Let MICHIGAN engineer the job — design and build the tools — broach the part — and do it all with UNDIVIDED RESPONSIBILITY.

WE DESIGN — BUILD — RECONDITION AND USE BROACHES

We design and build every type and size of broaches—broaching fixtures—involute gages (plug and ring) arbors —holders and pullers for broaching.

Michigan specializes in broach reconditioning and resharpening

Production Broaching Division

MICHIGAN BROACH COMPANY

10371 NORTHLAWN AVENUE
DETROIT 4, MICHIGAN

For complete information on Production Broaching, send your parts prints and production requirements to Department K, Michigan Broach Company.

INSIST ON haskins QUALITY

Haskins Flexible Shaft Machines meet the demands of modern competition. They are *quality* machines—built of quality material by men of experience, experts in their line. The flexible core, made of special Swedish music wire—the heavy duty rubber fabric casing—the removable casing ends—the ball bearing grease-sealed spindle—the amply-powered motor—these are outstanding features.

And there are literally hundreds of specific operations for these portable tools . . . grinding, drum and disc sanding, rotary filing, wire brushing, buffing and polishing. But whatever the job, a Haskins will do it better—speedily and economically, yet carefully and accurately, too. Send for details.

HS-4, ½ h.p. multi-speed, countershaft unit, 1800 to 7200 R.P.M., mounted bench height on caster base, 360° swivel.

R. G. HASKINS COMPANY

623 S. CALIFORNIA AVE. • CHICAGO 12, ILLINOIS

HASKINS

haskins

FLEXIBLE SHAFT EQUIPMENT

GROOVING

RECESSING

BACK FACING

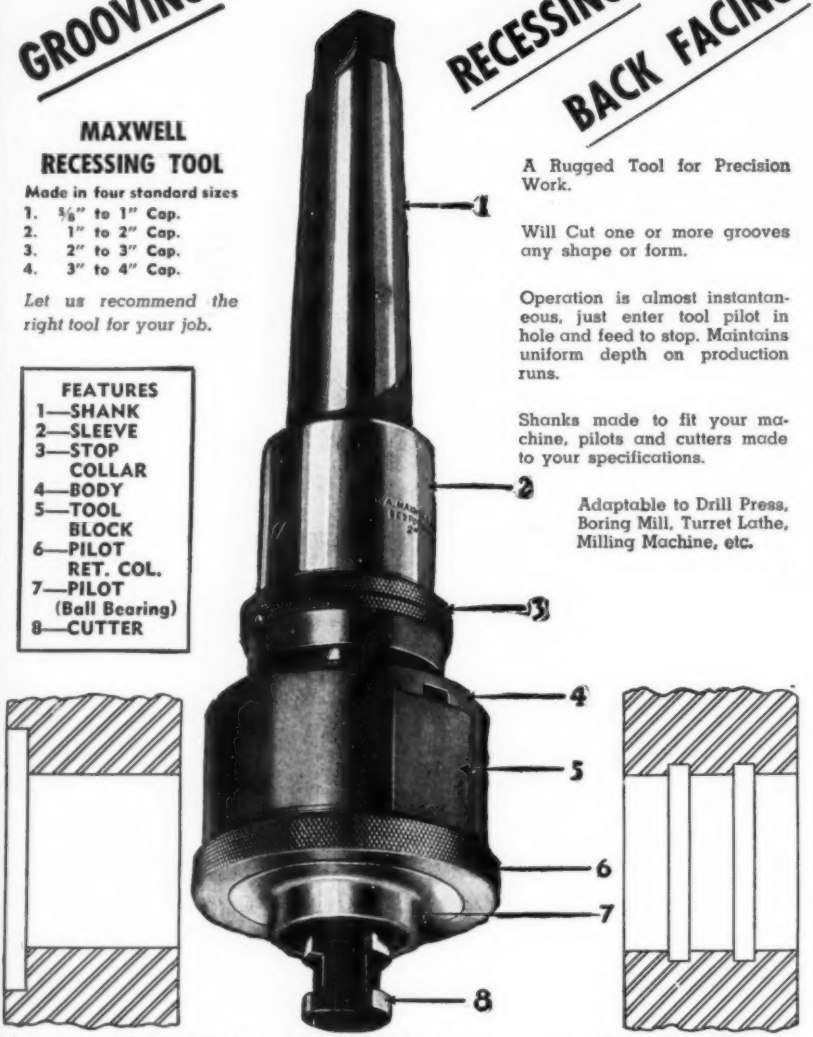
MAXWELL RECESSING TOOL

Made in four standard sizes

1. ⅝" to 1" Cap.
2. 1" to 2" Cap.
3. 2" to 3" Cap.
4. 3" to 4" Cap.

Let us recommend the right tool for your job.

FEATURES
1—SHANK
2—SLEEVE
3—STOP COLLAR
4—BODY
5—TOOL BLOCK
6—PILOT RET. COL.
7—PILOT (Ball Bearing)
8—CUTTER



A Rugged Tool for Precision Work.

Will Cut one or more grooves any shape or form.

Operation is almost instantaneous, just enter tool pilot in hole and feed to stop. Maintains uniform depth on production runs.

Shanks made to fit your machine, pilots and cutters made to your specifications.

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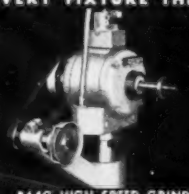

B640 HIGH SPEED GRINDING ATTACHMENT

B643 MOTOR DRIVEN WORK HEAD

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Model B600 Single Speed Universal Tool Grinder.

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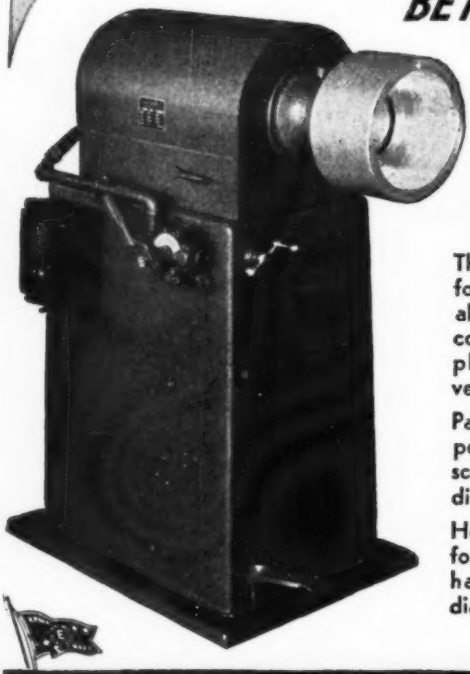

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This machine is unsurpassed for polishing and finishing aluminum stainless steel, and copper utensils, bowls, discs, plates, reflectors, and even very thin metal shapes.

Part is held by vacuum and polished while revolving. No scratching. No marring. No distortion.

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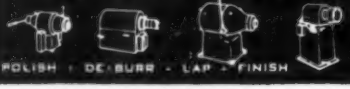

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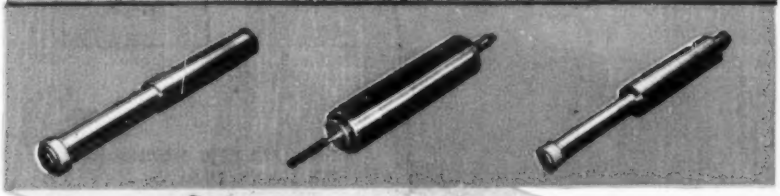

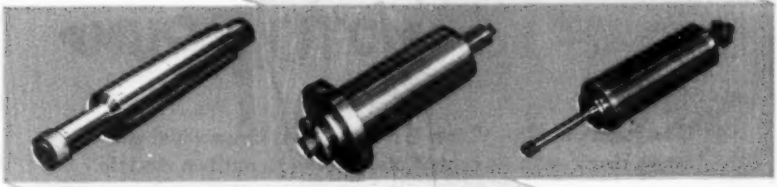

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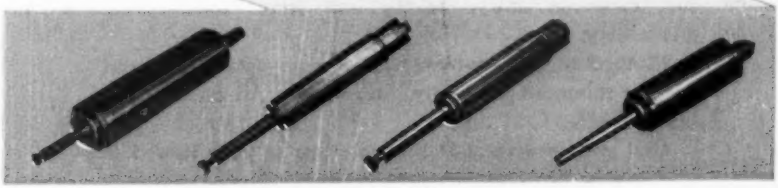

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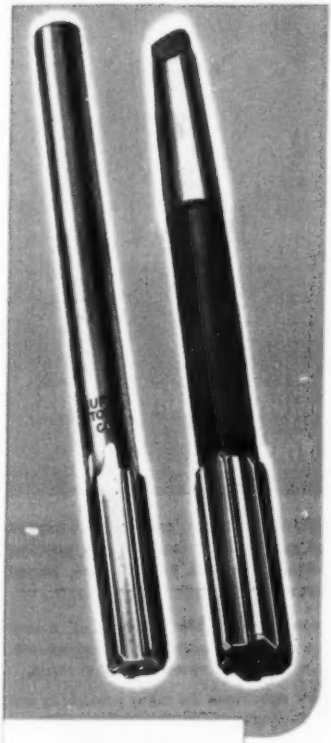

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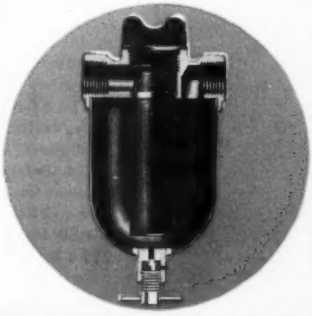

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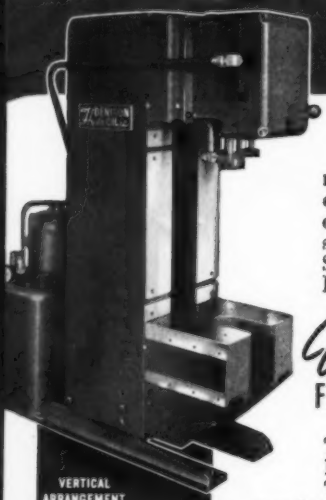

Here, in MULTI-UNITS, is a complete oil-hydraulic power . . . as packaged components, ready-to-operate, and standardized . . . for easy, economical application to your special machinery or production equipment wherever pressures up to 4 or 6-tons are required. Or, there's a Standard four-position frame with which the Pumping Unit and Power Head may be used.

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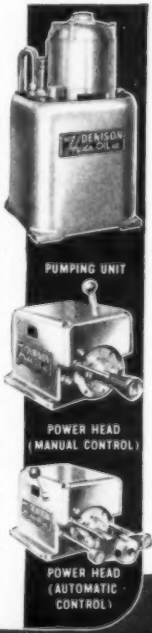

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Straight type air grinders with 6" wheels were used in this railroad shop for grinding down weld beads. When the Rotor Application Engineer saw this job, he recommended they change to vertical type air grinders with 6" flared cup wheels. The change gave these results:

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The Rotor Application Engineer will gladly survey *your* portable tool operations and help boost *your* output per man per dollar.

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WHATEVER YOU FASTEN . . .

COMPOSITION TO COMPOSITION

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WOOD TO WOOD

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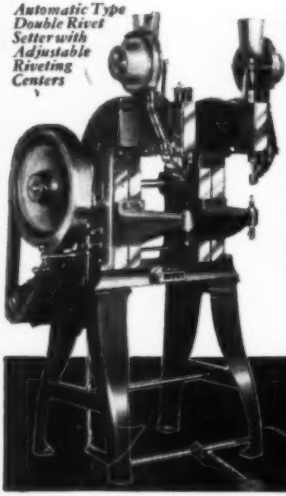

Automatic Type Double Rivet Setter with Adjustable Riveting Centers

FULL, FREE ANALYSIS OF YOUR FASTENING PROBLEM

You can learn, without cost or obligation, how your fastening output may be speeded up, and your costs reduced. Just send a blueprint of a sample of your assembly to Chicago Rivet and ask for a fastening analysis. Chicago Rivet engineers will gladly analyze your particular problem, and recommend possible ways of speeding production, cutting costs, and saving manpower. Actual production rates on your fastened assemblies can be set up as a result of these findings. Make use of this free, expert service that may increase your profits.

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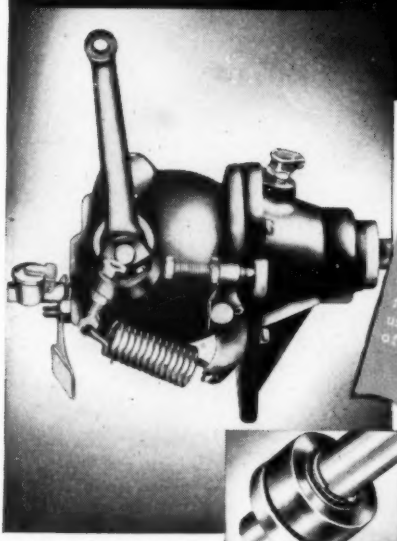
5 REASONS WHY PIERCE GOVERNOR SPECIFIES WALDES TRUARC RETAINING RINGS



"Waldes Truarc Retaining Rings on our precision flyball governors had five distinct advantages over wire snap rings previously used:
1. speedier assembly and disassembly—
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3. greater thrust power—
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U. S. PAT. RE 18,144

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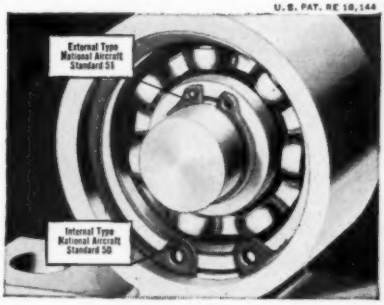

WALDES TRUARC TRADE MARK **RETAINING RINGS**

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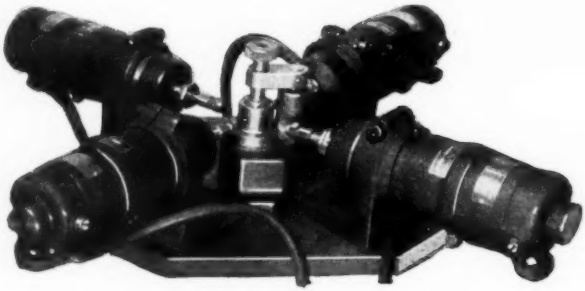

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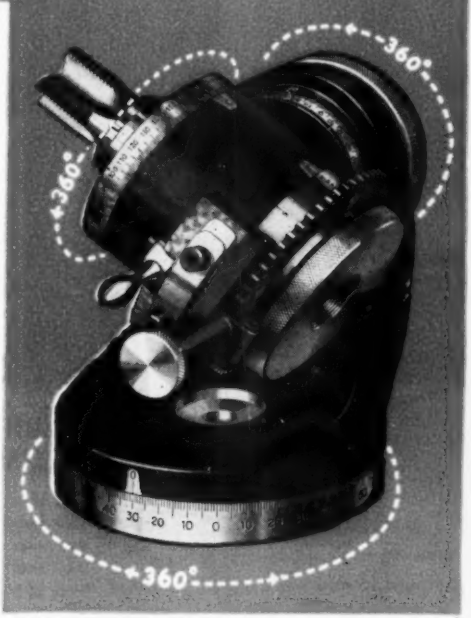
360° graduations in three planes enable you to regrind or sharpen your tools with any desired angle or cutting edge. Automatic Indexing, provided with a vernier adjustment, permits the re-establishment of concentricity on tools where one or more cutting edges have been unduly worn or damaged.

Only the Cleveland Universal Indexing Head provides three plane 360° settings *plus* compensating automatic indexing. Now available from stock at a *new reduced price.*



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KOLORKOTE offers these advantages to any manufacturer who keeps a stock of tool steel on hand:

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6. **Wherever workmen do not understand English, brand names and labels mean little, but COLOR IS UNIVERSAL.**

KOLORKOTE adds a plus to the proved advantages of Milne Tool Steels for every metal cutting and forming need. **KOLORKOTE** wall chart, with exact colors, and heat treating information, free on request, from the Milne office near you.

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Alloy, and Carbon

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To A.A.R. Specification M-302
To U. S. Navy
Specification 46-I-7C of May 1, 1944

TIMKEN
GRAPHITIC STEELS
Machine Faster
Wear Longer

STRESSPROOF
T. M. Reg. U. S. Pat. Off.
STEEL
COLD DRAWN — FURNACE TREATED
"More than just strain-relieved."
"HIGHER IN-THE-BAR PHYSICALS"

NITRALLOY TYPE G 135 MODIFIED (AIRCRAFT) TO AMS 6470-A

also carried in Warehouse Stock.

NEW!
Pneumatic
SCREW DRIVER
by
ARO
First and Only
POWER SCREW DRIVER SPECIFICALLY BUILT FOR SMALL SCREWS!
● Amazingly small in size—this new ARO Screw Driver is only the size and shape of the average cigar . . . weighs but 8 ounces . . . is 4⅛" long and ¾" in diameter. Simple to operate—drives screws from No. 1 to No. 6 . . . with fully automatic operation! Pneumatic powered. No manual throttle control . . . starts automatically when tool is applied to work. It adjusts itself to every driving condition.
Also available with adapter socket for nut setting. Simple construction for long life and tool-proof operation. Entire tool is chrome finished. Ideal to speed up assembly of radios, cameras, electrical appliances, electronic instruments and controls, and many other products having small screws and nuts. Write today for more information. The Aro Equipment Corporation, Bryan, Ohio.

UNITED STATES ELECTRICAL TOOLS

will help you glide into your 1946 programs with ease and every assurance of better and more economical production.

These famous tools are better than ever . . . . embodying the experience gained since 1897 PLUS the lessons learned "the hard way" during the war years.

Look to United States Electrical Tools to Help You Cut Costs and Increase Production in '46

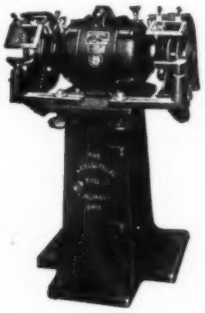
HEAVY DUTY FLOOR GRINDERS

Adjustable to Wheel Wear
Model 10
for 12" to 20" wheels

Heavy duty ball bearings, enclosed in dust-proof boxes, support heavy one-piece, alloy steel spindle. Push button control with overload protection. Semi-steel wheel guards are hinged door type. ADJUSTABLE TO WHEEL WEAR. High-grade chrome-manganese alloy steel spindle is provided with positive shaft-locking device for holding shaft while renewing wheels.

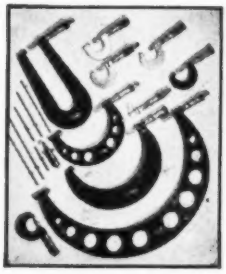
Motors are capable of heavy duty service, built to N.E.M.A. standards, for continuous service at full load with a temperature rise of 40 degrees.

Standard equipment includes adjustable tool rests, eye shields, straight flanges, water pot and tool tray on 2 h.p. and 3 h.p.



The **UNITED STATES ELECTRICAL TOOL** *Co.*
CINCINNATI, OHIO

When it's a STARRETT "Mike"



Your machine workers and inspectors take the accuracy of a Starrett "Mike" for granted and what's more, they have no question of your knowledge of tools and your desire to provide them with the finest when you standardize on Starrett Micrometers in every tool crib.

Familiarity with and confidence in the precision tools you provide is an important factor in both the quality and quantity of precision work your shop turns out. That's why it pays to ask your supply house for STARRETT Micrometer Sets.

Now, with 4 Service Stars

THE L. S. STARRETT CO. • ATHOL • MASS. • U. S. A.

World's Greatest Toolmakers

STARRETT TOOLS

STARRETT

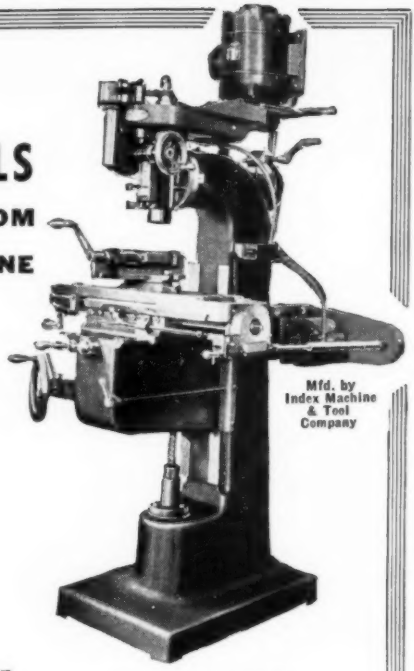
PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

INDEX VERTICAL MILLS

FOR THE TOOL ROOM OR PRODUCTION LINE

For use with end mills ⅛" to 1" in steel. Equipped with verniers, as standard equipment in addition to micrometer dials on table actuating screws for locating. Further accuracy available with rods and indicators which can be furnished as extra equipment.

If you want speed and precision on milling, drilling and boring send for a catalog on Index Mills.



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12" TOOL ROOM ROTARY TABLE

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

INDEX MILLS

Index Mills participated in all important war production programs from camera and guns to atomic bombs. Ask any owner how they like their Index Mill.

Write to Factory Sales and Distributing Agents for complete information.

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Dismaster –the Best Metal Band Saw

Blades are now packed in the Best Box . . .

"LENOX"

SAFE-T-BOX

NO METAL TO CUT THE HAND

TRADE MARK

Stock ready to draw out

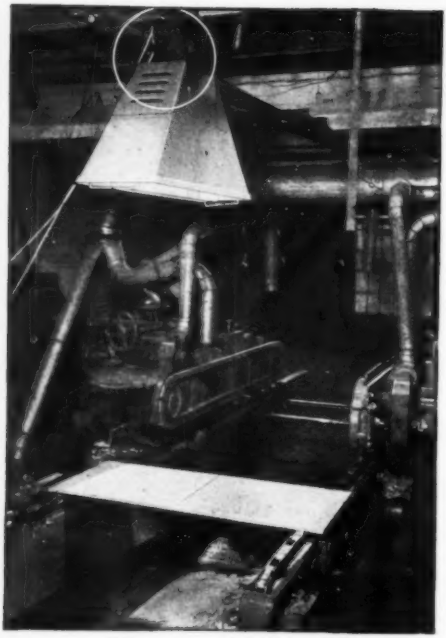
No wires to cut

Loose ends can be drawn back into box

Distributors everywhere have these blades in stock

Adaptable for DO-ALL, GROB, TANNEWITZ and all other Band Saw Machines. Accepted by all industry.

AMERICAN SAW & MFG. CO. SPRINGFIELD 1, MASS.



The NEW CARTER Guide-Line LIGHT

with

Tilting Attachment

helps set
Base or Center Lines
and Layouts
Speeds Work
Reduces Layout Effort
on

- **Tandem Saws**
- **Double-End Tenoners**
- **Veneer Matching Tables**
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● A clear, definite shadow-line is cast on the material by the Carter Guide Line Light, indicating center-line, base line or exact path of the saw or pattern, before work is started. With new tilting attachment, operator can "block-out" choice areas, best cuts, avoid flaws, prevent waste, save panels. Saves lay-out-time, speeds any work requiring base or center line guides. Shadow lines at right angles can be cast simultaneously, using one stationary and one tilting light. Complete data FREE. Send inquiry now.

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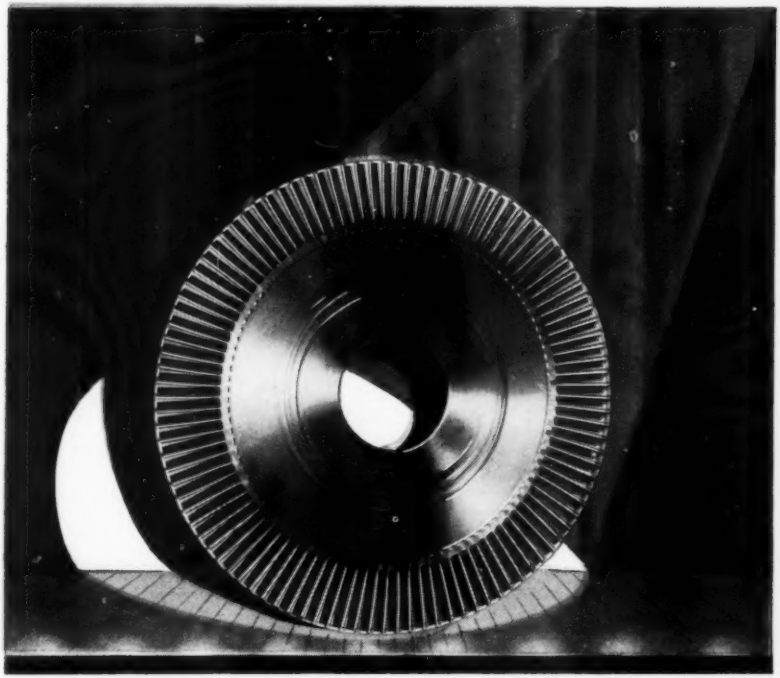

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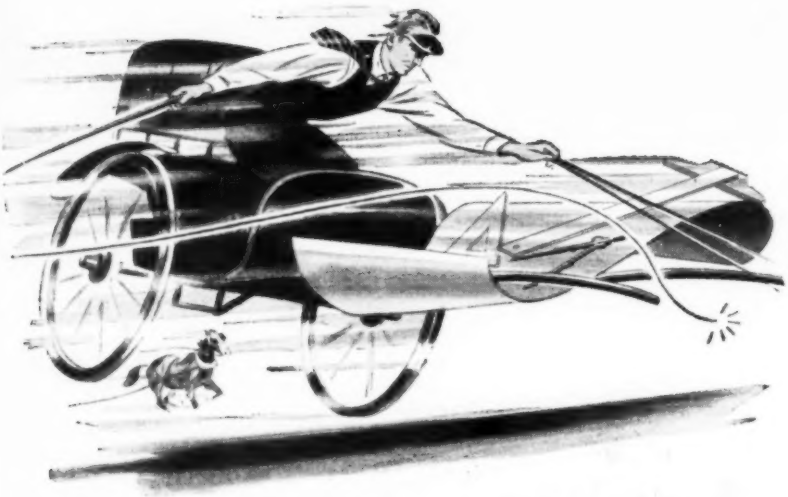

Putting the CART before the HORSE-POWER

— is smart planning

The machine designer who starts with a standard motor in mind and builds a machine around it, often winds up with equipment that is only a compromise with his original idea.

The Welco-wise design engineer doesn't limit himself. He just plans the machine to do the best job the best way, then puts the motor problem up to Welco.

You need never worry about such things as an unusual mounting position or requirement for large motor output with small motor space. You build the machine and Welco will make to your specifications the perfect motor to power it.

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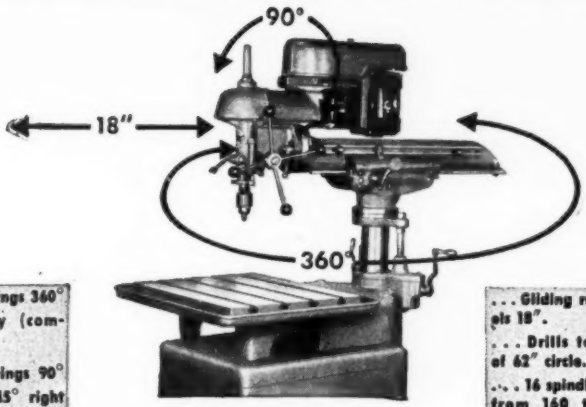
GET IN THE *SWING* AND CUT COSTS WITH WALKER-TURNER RADIAL DRILLS



. . . Head swings 360° horizontally (complete circle).

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. . . Gliding ram travels 18".

. . . Drills to center of 62" circle.

. . . 16 spindle speeds from 160 to 8300 r.p.m.

PRICE: $352.50

less base and motor
slightly higher west of Rockies
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If you're drilling, tapping or reaming holes up to ½" in large workpieces . . . Walker-Turner Radial Drills are the answer for faster production and lower cost per piece.

Within their drilling capacity, these versatile machines have a greater range than standard drill presses . . . are easier to operate and simpler to control than heavy radials. Low first cost, low upkeep and low power consumption are other important advantages of Walker-Turner Radial Drills. For complete description, send for our latest catalog.

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DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
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HIGH SPEED TAPPING . . . WITH *AUTOMATIC* PROTECTION FOR TAPS

Reduce Tap Breakage and Damage By Using a Procunier Tapping Head

The new Procunier sensitive high-speed tapping head allows fast, accurate tapping with a minimum of tap breakage. Driving power to the tap is automatically regulated by pressure applied to a special clutch. This double-cone, cork-faced, friction clutch engages the conical surfaces of the drive and reverse shells, driving the tap with a soft "cushioned" action. The high sensitivity of the clutch practically eliminates tap breakage. Operators can quickly detect dull or loaded taps by the "feel" or pressure required to drive them—also, the clutch instantly slips should the tap strike bottom or stick because of tap loading.

Send coupon for circular giving full details, specifications and prices.

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A new practical tap holder with many advantages. A broached section of the chuck receives the flattened surfaces on the spring collet, while the tap has a positive drive through the square hole broached in the collet. The tap is always in true alignment — tap shanks are never scored or "chewed up."

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Crobalt is a non-ferrous cutting alloy containing principally chromium, cobalt, tungsten, vanadium, zirconium and carbon. Crobalt tool bits will cut much faster and will require grinding less frequently than do tools made of high speed steel. Crobalt also offers far greater resistance to chipping than do carbides.

Crobalt tool bits are especially engineered for high speed production—Crobalt isn't a cure-all, but it may prove to be just the tool you should be using in your plant—try Crobalt.

Crobalt bulletin No. 45 contains valuable technical information and quotes prices on standard size tool bits—Send for your copy.

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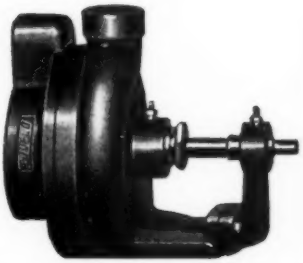
Literally, a life preserver—for the steady, unwavering flow of coolants PRESERVES the life of your equipment or the products on which it is working. Coolants **prolong** efficiency life—especially when they hit the spot through these precision-designed and precision built FULFLO Centrifugal Coolant Pumps—better than ever because of Fulflo's war-experience.



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Right or left rotation; direct, belt or motor drive.
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FULFLO HYDRAULIC NON-CHATTERING BY-PASS, OIL-RELIEF VALVES assure pre-determined specified, uniform pressure. Standard or flange types. Pipe sizes ¼" to 2"

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Send your Gage Blocks in for inspection before the big rush begins!

NEW!

Catalog 17—just published. Write for your copy!

YOU'LL want your Gage Blocks in perfect condition for the competitive days of peacetime manufacturing ahead! **NOW** is the time to send them in to Ford for inspection. The cost is only *20 cents a block* (f.o.b. Dearborn) for A and B Gage Blocks up to one inch and for each inch of length of longer blocks. (Minimum charge $1.) You'll receive an itemized Certificate of Inspection showing you which blocks, if any, need reconditioning to restore the original accuracy (.000004" or .000008" ±). Details and prices of reconditioning, including the Ford chrome-plating method, will be found in the new Jo-Block Catalog No. 17. Write for your copy today. Ford Motor Company, Johansson Division, Dept. 81, Dearborn, Michigan.

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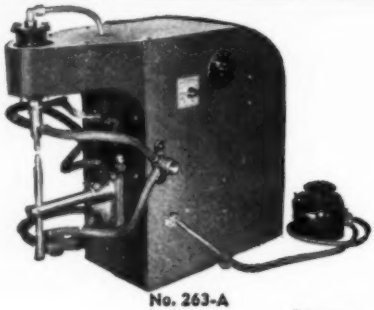

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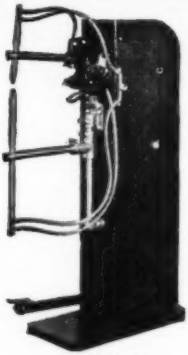

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No. 111 Welder

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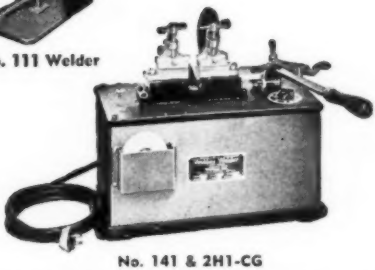

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BAND SAW WELDERS
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PORTABLE WELDERS

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The Secret of
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Superiority
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TRADE MARK
The ball and socket connecting the internal lever to the valve affords *leverage ratio* to give full discharge with a slight flex of the hose.

Air-O-cheks are precision machined from bar brass and stainless steel

Complete Air Hose Assembly. Consists of Air-O-chek Air Gun and standard pipe fitting ferruled to the hose. Convenient and economical. Shipped ready to install.

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These are just a few reasons why Air-O-chek Air Guns are the logical first choice of management, maintenance men and operators wherever compressed air is used for blowing.

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Results Speak! Install Air-O-chek Air Guns and compare results with the best you have ever used. Catalog on request.

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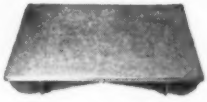

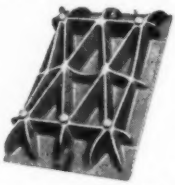

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SLOTTED ANGLES

In 19 sizes, ranging from 4 x 9 x 5 and up—in both scraped and ground finish.

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In 10 sizes, ranging from 4 x 3¼ x 5 and up — in ground finish.

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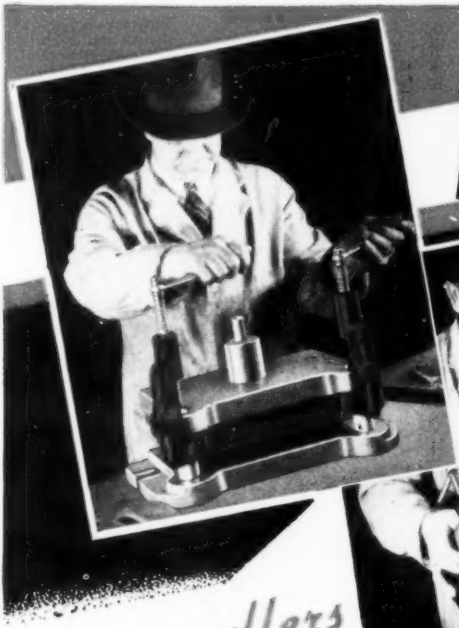

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GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

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★ ***ENGINEERED TO*** *supplant hand finishing, and for bench work.*

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* Embodies NOPAK Patented Cored-Disc Principle and other famous NOPAK features.

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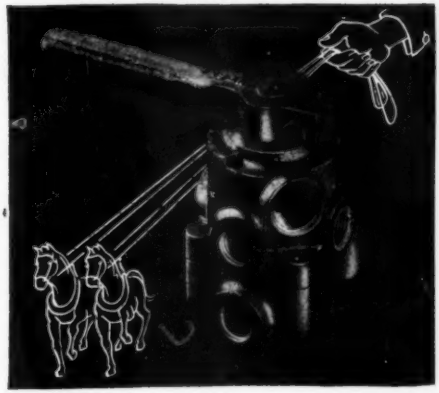

Controls Two Cylinders — it's the NOPAK* Dual 4-Way!

NOPAK CYLINDERS —for Air or Low Pressure Hydraulic Power, available in Standard and Heavy Duty Types, with Adjustable or self-Regulating Cushions. 6 Standard Mountings.

This valve has proven its merit in many applications in which dual cylinders are used in close relationship. This valve is so designed that two cylinders may be actuated in either direction, in any sequence desired.

A variety of operating cycles may be set up . . . and governed by a single control lever. This is a decided advantage in manipulating inter-dependent machine movements. The Dual 4-Way embodies all of the performance features which you expect of NOPAK Valves . . . easy, finger-touch operation, precision control, freedom from grit abrasion, long-lived, trouble-free service.

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At present the NOPAK Dual 4-Way Valve is available in one size only, which may be used on pipe lines ½" or smaller.

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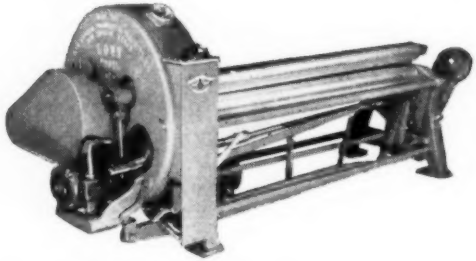
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

IT'S NEW
THE LOWN
HY-PRODUCTION FORMING MACHINE



SPEED UP YOUR PRODUCTION LINE WITH THE FORMER THAT HAS EVERYTHING.

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SPECIAL FEATURES: Power adjustment on the bending roll. Dial indicator conveniently located for operator's observance when operating finger-tip controls. Power opening and closing of arm or knock-down. Initial type, but different in that you have the minimum flat place on cylinders formed due to the way rolls are positioned. Rolls are so geared that you have perfect mesh even when the feed rolls are widely separated. All three rolls motor driven.

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AVAILABLE at this time in 5" and 6" diameter rolls in lengths of 42" to 96" ranging in capacity from 3/8" to the lightest metals.

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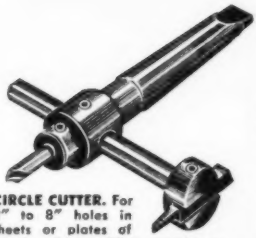
"Dealers in Principal Industrial Cities"



CIRCLE CUTTER. For 2" to 8" holes in sheets or plates of metal, plastic, fibre, wood, etc. 1¼" pilot. ¼" x ¼" bit. Straight or taper shank.

SPINDLE STOP. Expands by collet action in ¾" headstock spindle hole. Does not scar or burr. Extension can be turned down or removed.

DIE HOLDER. Accommodates 1" and 1½" button dies. Threads can be cut to ⅜" x 3". Chases threads straight and true. No. 2 MT shank.

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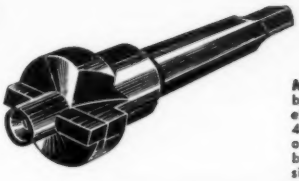

MULTIFACER. For counterboring seats of many diameters and contours. Made in 4 stock sizes with straight or taper shanks. Standard bits can be ground to desired shapes.

• YOU'LL BE PROUD TO OWN THESE *Tools.*

There's quality through and through these tools—fine materials, fine construction, fine finish. They belong in high-class machine shops and factories for special jobs and production runs.

Think of the work in your shop right now and you'll see where one or all of these tools would save time and simplify operations. Think of past jobs on which the Multifacer or Circle Cutter or Spindle Stop or Die Holder would have paid for itself on a single run.

We have so much faith in these tools that we'll be glad to send you any of them on approval if you write on your firm's stationery to show your responsibility. If you want to know more about them first, mail the coupon for our fully descriptive literature and prices. Do this now while it's on your mind.

ALLEN TOOL & MFG. CO.

734 Steele Ave., Dayton 10, Ohio.

Send complete information on Multifacers, Circle Cutters, Die Holders, and Spindle Stops.

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City, State

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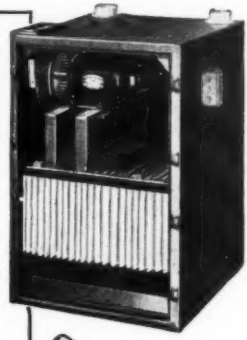
DUST COLLECTORS

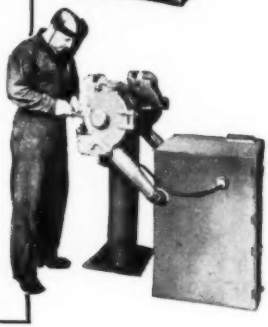
trap dust at its source . . . protect valuable machinery and workers' efficiency

TORIT Dust Collectors are self-contained, portable, and easy to install. They save fuel by returning filtered air to the room.

Nearly 10,000 TORIT Dust Collectors, ranging from ⅓ HP to 3 HP, are in use. They fit every production plan, and have paid big returns in plant cleanliness and employee efficiency.

Write for TORIT Dust Collector Catalog No. 30 giving full information on the different size units.





TORIT MANUFACTURING CO.
303 Walnut Street St. Paul 2, Minn.

THEY PACK THE PUNCH IT TAKES
TO DRILL MORE HOLES FASTER
SKILDRILLS
"101"
⅜-INCH
$60
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$68
Helical-Cut Gearing and Bearing Assembly
Triple-reduction gearing provides low spindle speed and greatly increased torque. Timken tapered roller bearings on chuck spindle ensure smooth power and longer life

When you're drilling on any job, in production or maintenance, you want a drill with plenty of *power*, yet *light in weight, compact* and *easy to handle.* You get all this in SKILDRILLS plus *built-in quality* that keeps them running smoother longer at lower cost. There's nothing like a demonstration on your own work to show you why SKILDRILLS are your best buy today. Call your distributor now!

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
Factory Branches in All Principal Cities

PRODUCTO

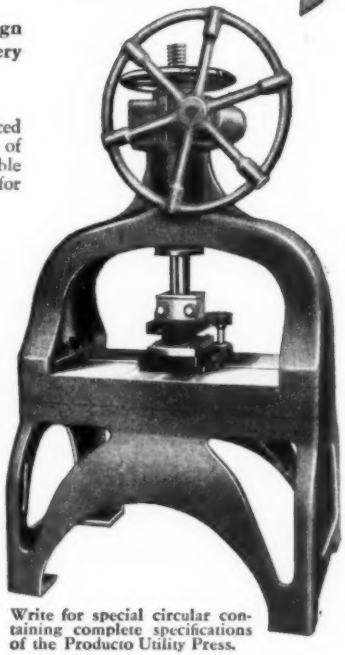
UTILITY PRESS

The most modern design of a screw press for every Tool and Die Room.

Tremendous power . . . plus advanced design, fits this press for a wide variety of work . . . makes it practically indispensable in the machine shop and tool room for these general uses:

1. **For shearing Punches and Dies in the Tool Room.**
2. **For separating Punch and Die Holders on large liner pin Die Sets.**
3. **For assembling and lining Punches and Dies.**
4. **For use as an Arbor Press.**

It is also very efficient as a Straightening Press. Also often used for short broaching operations, pressing out pins from Die Sets, disassembling spindles or shafts from press fits in bearings, etc., because of its great power and the convenient provision for passing tools or work through the 3" hole in the bed. Cap. 50 Tons — Net Wt. 3500 lbs.



Write for special circular containing complete specifications of the Producto Utility Press.

THE PRODUCTO MACHINE COMPANY

990 HOUSATONIC AVE. BRIDGEPORT, CONN.

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3017 Medbury

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NEW YORK, 197 LAFAYETTE STREET

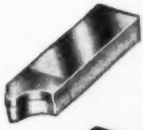
PEACETIME PRODUCTION
MEANS BACK TO COMPETITION!

and here are the tools that will give you the "edge" on

COMPETITION!

● Yes, peacetime production will have its problems, even as war production. Not the *same* problems, but just as tough. Competition will require tools that cut clean—fast—smooth—accurately.

You can depend upon MEYERS GENERATED CARBIDE-TIPPED FORM TOOLS to give you the "edge" on competition, by giving you more pieces per hour—more pieces between grinds—and a much smoother finish. On actual production runs, MEYERS GENERATED CARBIDE-TIPPED TOOLS have boosted production by more than 500%!

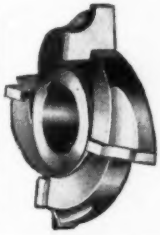


Send us your prints for quotation

MEYERS GENERATED

Carbide-Tipped

FORM TOOLS



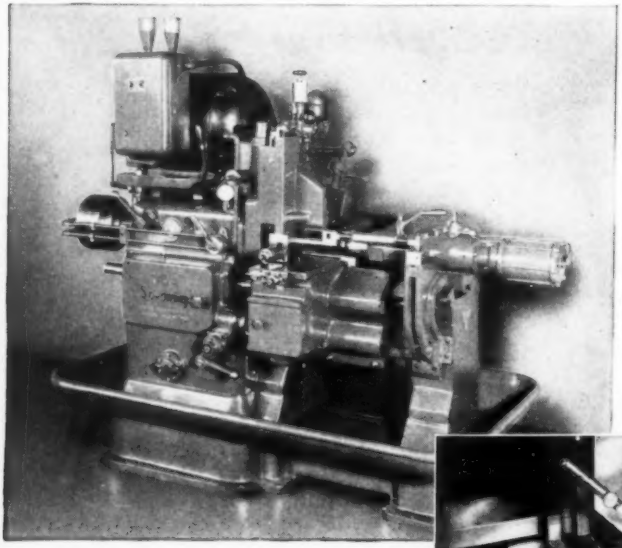
W. F. MEYERS COMPANY

Established 1888

1012 FOURTEENTH STREET • BEDFORD, INDIANA

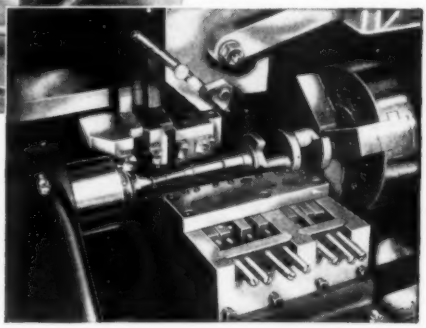
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK



Model LR Lo-swing Lathe equipped with standard front, rear and vertical slides.

Close-up view of machine tooled for crankshaft job.



MODEL LR *Lo-swing* REDUCES OVERALL MACHINING COSTS ON CRANKSHAFT JOBS...

PROBLEM: To provide a lathe for automatically turning, facing and machining a 45° undercut in the shoulder of a small crankshaft.

SOLUTION: The Model LR Automatic *Lo-swing* Lathe selected for this job was equipped with standard front, rear and vertical slides as shown in the large illustration. In the close-up view of the tooling, it will be noted that the short end of the crankshaft, previously machined, is held in a three-jaw, air-operated chuck to lend increased rigidity to the shaft. The parallel diameters as well as the tapered portion of the crankshaft are turned with carbide tools mounted on the front slide, while all shoulders are faced to length with a tool mounted on the rear slide. The 45° undercut, machined in the face of the large shoulder, is cut with a tool mounted on the vertical slide, which transmits a 45° feed-in movement to the tool as the slide feeds down. The entire operation is automatic . . . the operator simply loads and unloads the work and operates the starting lever.

Our engineers are at your disposal for assistance with any of your turning problems.

LATHE NEWS from SENECA FALLS

Time-honored abrasive products are now further distinguished by *a renowned name*

SIMONDS
ABRASIVE CO.

For more than half a century the name Abrasive Company has been synonymous with high quality grinding wheels and abrasive products. With the years has come a tremendous increase in the use of such products and the unqualified trademark designation "Abrasive" is now inadequate as a general term to distinguish this old company. Therefore, in order to establish a more distinctive identity for the organization, a more individual crest for its quality and service, the name Simonds, renowned for over a century for excellence in cutting tools, will designate product and company.

Operating under the same management and policies, SIMONDS ABRASIVE COMPANY will continue to turn out the same products of top performance which so distinguished the Abrasive Company during the past half century. SIMONDS ABRASIVE COMPANY goes forward, pledged to continue to justify the confidence of its old customers and to merit and inspire the patronage and good will of new ones.

SIMONDS ABRASIVE CO., TACONY AND FRALEY STS., PHILADELPHIA 37, PA.

Save 5 Ways...

with SIEWEK
Fixture Clamps and Fittings

- Cut fixture designing and drafting time 50% to 75%
- Adaptability to many jobs avoids need for specials
- Hold work securely...No slipping...No spoiled work
- Quick acting...Saves valuable time on all production
- Eliminate service of toolmaker—9 times out of 10

24 DIFFERENT TYPES
3 SIZES EACH

Manufacturers of
SIEWEK
Rapid Clamping
Drill Jigs

Also... JACKS • JACK LOCKS • FIXTURE LOCKS
REST BUTTONS • RESTS AND CAMS • HAND KNOBS

Instead of designing "specials," use Siewek clamp assemblies and parts... the time saved in planning and drafting pays for the cost of the complete assemblies. We furnish full size template drawings to trace from when making layouts.

Heat-treated and hardened Siewek clamp bars give years of service—with ample safety margin. Uniform, right-angle pressure assures secure holding. Write today for full size template drawings for layout use.

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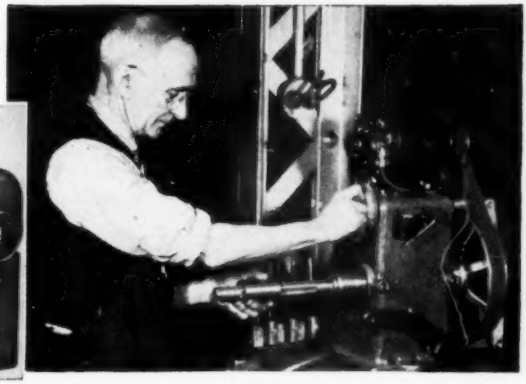
231 SOUTH LA SALLE STREET • CHICAGO 4, ILLINOIS • DISTRIBUTORS IN PRINCIPAL CITIES

The Sunnen Precision Honing Machine in the Landis plant ➤



▼ *A Landis Precision Grinder*

Landis Uses the SUNNEN PRECISION HONING MACHINE!

on Short Runs and Special Jobs

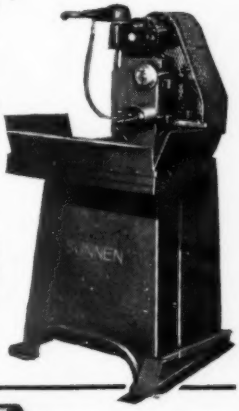
While hundreds of manufacturers use the Sunnen Precision Honing Machine on high production jobs, Landis uses it chiefly to handle short-run jobs.

Here's where the quick, inexpensive set-up of the Sunnen Precisi Honing Machine is of greatest value. A mandrel to fit any size hole frc .185" to 2.625" can be inserted in this machine in less than one minut

At Landis Tool Company, tolerances are usually held to .00025" and a good commercial finish is obtained in bushings of cast iron, hard and soft steel.

The Sunnen Precision Honing Machine produces a super-smooth finish — accurately duplicates sizes — does not require skilled labor — no jigs or fixtures needed — is economical to operate and low in cost.

Let a Sunnen engineer show you how these advantages can be applied to your job in your plant. Write for a free bulletin giving complete details.



SUNNEN PRODUCTS COMPANY

7935 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

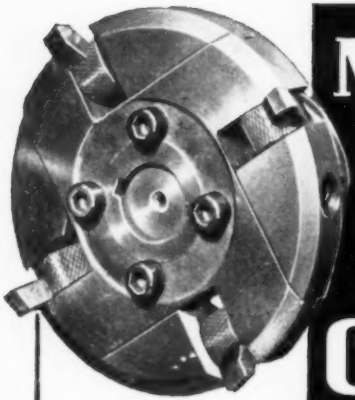
Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carburetor Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



NEW-FIELD *Universal* FLY CUTTER

MAKE 4 TO 6 CUTS WITH DIFFERENT STANDARD BITS *IN ONE OPERATION!*

Using any type high-speed steel or carbide bit, the NEW-FIELD UNIVERSAL FLY CUTTER can be used for multiple cuts in one operation! This new type fly cutter eliminates any need for special cutters for each different milling operation.

Here's another New-Field economy feature: bits can be repaired, resharpened or reground for a new milling operation in your own shop! NEW-FIELD UNIVERSAL FLY CUTTERS save hours of down-time!

To boost production ... cut costs ... write today for full information about the NEW-FIELD UNIVERSAL FLY CUTTER ... or send a wire.

A FLY CUTTER THAT CAN BE USED FOR FLAT SURFACES ... STRADDLE MILLING ... SLOT CUTTING ... IDEAL FOR MACHINING PLASTICS!

Versatile! New!

NEW-FIELD MACHINED PARTS CO.

Manufacturers of

ADJUSTABLE MACHINE TOOLS — UNIVERSAL BORING BAR HOLDERS

General Offices — 549 W. Randolph St., Chicago 6, Ill.

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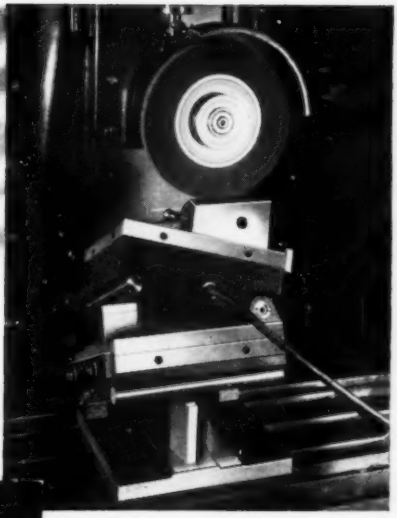
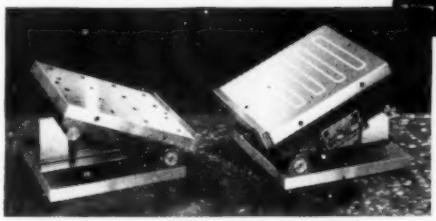
Distributors throughout U.S.A. and Canada

Get More Work from Your TOOL ROOM GRINDERS *with* UNIV-ANGLE





Above: A typical UNIV-ANGLE set up

Left: The two UNIV-ANGLE units; magnetic at the right, non-magnetic at the left. They may be purchased and used either separately or together.

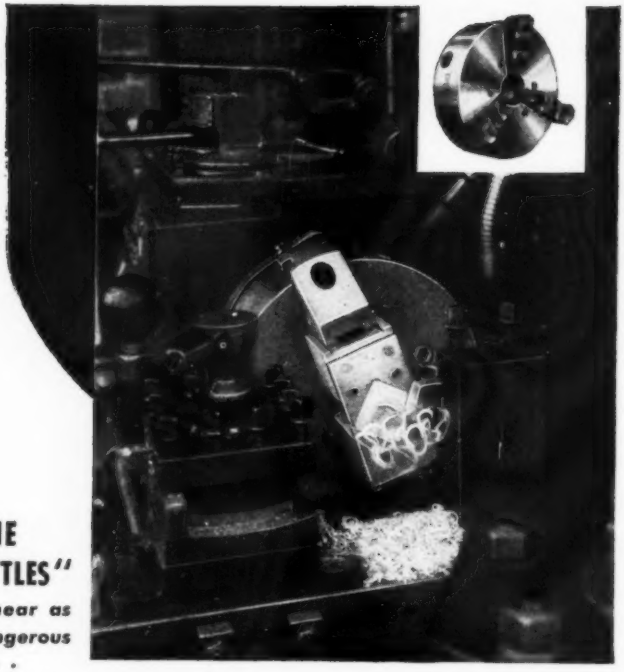
THE UNIV-ANGLE will reduce set-up time on angular grinding work—even the most complicated compound angle—to a matter of seconds. Compare this with the hour or more often required using conventional methods. UNIV-ANGLE set-ups are more accurate, too, because the angle is determined by standard gage blocks. There are no dials or scales; the setting is positive. UNIV-ANGLE holds work of any shape securely but without distorting pressure, by means of magnetic attraction. Compound angles can be changed from right to left hand in a few seconds by simply turning the top unit on its base. The work does not need to be touched.

There are two UNIV-ANGLE units to a set, one magnetic and one non-magnetic. Both are sturdily build of oil-hardening steel ground and lapped to the closest limits. The units may be purchased and used either separately on single angles or together on compound angles.

The UNIV-ANGLE will save you many hours and many dollars on angular grinding work and on jig boring and inspection work, too. Try one in your tool room and see for yourself.

Robbins ENGINEERING COMPANY

318 MIDLAND AVE. • DETROIT 8, MICHIGAN



"NEW WINE IN OLD BOTTLES"

is nowhere near as potentially dangerous as . . . . .

OLD CHUCKS IN NEW MACHINES

The complications that can result from such a "saving" in *equipment* cost can play hob with your unit production costs and constitute a needless drain on profits.

Ask yourself a few questions. Is the design of my present chucks the most suitable for handling work-pieces involved in reconversion operations? Will present chucks place holding-grip in correct relation to tool-pressure, and will they prevent marring of finished work? Are the jaws so designed as to permit quick and easy attachment of special work-holding devices?

Remember the Cushman axiom: "You can't machine it economically unless you hold it right", and consult Cushman engineers . . . maybe the old chucks can be salvaged if sent back to us for overhaul and renewal of some parts . . . maybe you need an entirely different type of chuck. In either case we are at your service in the fullest sense of the word.

THE CUSHMAN CHUCK CO.
HARTFORD 2, CONN.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

SHAPING · Milling · Drilling · Boring

NOW AVAILABLE ON *Bridgeport*

TURRET MILLING MACHINE . . . .

A new shaping attachment adds greatly to the utility of Bridgeport machines. The design is such that this new attachment (shown on back end of overarm) can be mounted on existing Bridgeport turret Milling Machines and also on other types of milling machines and special production equipment.

Shaping operations can be performed at all angles, making this attachment fast and practical on die and mold work of all kinds, as well as for intricate slotting on production jobs.

The Bridgeport Turret Milling Machine with High Speed Attachment handles milling, drilling and boring at all angles, with maximum ease and convenience. It is accurate and speedy, sturdy and powerful—a precision machine for production demands.

Features include: — 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Write for illustrated bulletins giving full information.

Write for Illustrated Bulletins giving details

THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn*

REPEAT ORDERS Keep Rolling In!

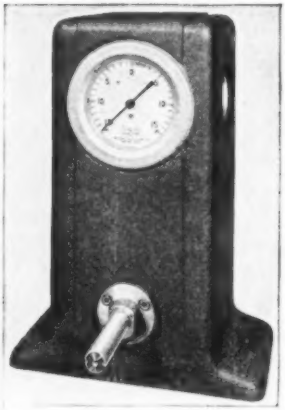
Accuracy Counts

You wouldn't order and reorder again if you didn't like the way the HOLE CHECKER works.

Many of the nation's leading manufacturers have ordered HOLE CHECKERS two, three and four times.

That's why we know it gives them what they want—quick, accurate checks of internal diameters—exposing at once any errors of size, taper, bell-mouth or out-of-round condition.

AMERICAN HOLE CHECKERS are easy to set up for Inspection or Production gaging. Accurate to .0001". Dial is read at a glance. Special sizing plugs are made to fit the production parts—thus it is easy to adapt the HOLE CHECKER to all types of internal dimensional control.



Get the HOLE CHECKER story! For prices, send prints or sketches of production part to be gaged and we will quote on your requirements.

HOLE CHECKER

Send for Bulletin 43-BB on AMERICAN PRECISION PRODUCTS

- Amplifying Gages
- Thread Checkers
- Bench Centers
- Radius Dressers
- Lapping Plates

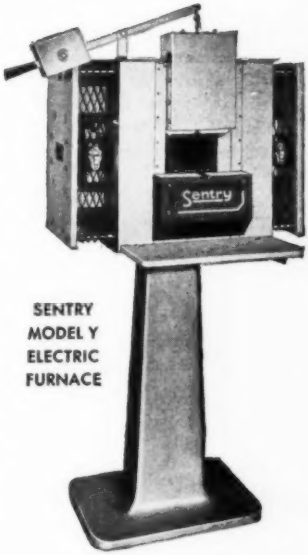
THE AMERICAN GAUGE CO.

125 Bayard St. DAYTON 1, OHIO

. . A SENTRY ELECTRIC FURNACE WILL BE IN OPERATION

COME to the National Metal Exposition in Cleveland, February 4th thru 8th and see a Sentry Furnace in operation. We invite you to bring a few specimen pieces with you so that we can demonstrate how clean, fast and economical Sentrys are in handling tools, cutters and parts made from High Speed Steel.

Sentrys assure correct hardness, true-to-size work, scale-free with no decarburization. Heat treat your tools and parts scientifically using Sentry Diamond Block controlled neutral atmosphere.



SENTRY MODEL Y ELECTRIC FURNACE

For tool room or production work. Sizes and capacities to meet your requirements. Ask for Bulletin 1024-1D5.

The Sentry Company

FOXBORO, MASS., U. S. A.

Sentry DIAMOND Block

CASTING RESIN FOR MODELS

● In addition to such uses as stretchpress and hydropress dies, jigs, assembly and holding fixtures, foundry patterns, and masking shields for plating, Durez casting resin is now being utilized very successfully in the production of models used for testing markets for consumer items.

DISPENSER AND CASE RING

While working with Durez casting resin for industrial patterns, the Westwood Engineering Co. decided to apply the same techniques and material to the production of test models. The gratifying results are illustrated.

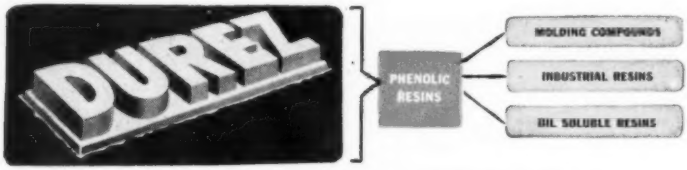
The cone-shaped piece is a top for a sugar dispenser. Note its unusually thin wall section. The other piece is an instrument case ring. Molds for both these parts were made direct from the originals of other material.

TWO-HOUR CURE

Standard procedure for most Durez resin castings calls for a four-hour set after the resin has been poured into the mold. This is then followed by an eight-hour baking period. Owing to the small size and thin walls of these pieces, *they were cured in less than two hours.*

INFORMATIVE FOLDER AVAILABLE

Naturally, it is impossible in this limited space to inform you adequately about Durez casting resin. However, we have prepared a technical booklet which covers the subject completely, including valuable detailed information which may prove helpful in reducing your production costs. Send for this free folder now. No obligation, of course. Durez Plastics & Chemicals, Inc., 6012 Walck Road, North Tonawanda, New York.



PLASTICS THAT FIT THE JOB

HIGH *Quality* in HIGH *Volume*

is

Here To Stay...

That's Why You Still Need...

LIPE LATHES

Maybe you thought some of the wartime tolerance and allowances were fussy—a waste of time and money. But if they erred, they erred on the right side—the record of American armaments proves that. More—your competitors have learned how to turn out that high precision in high volume, at a price. And they're not going to stop now. Chances are they'll try to produce and sell *still finer limits.*

Your best competitive answer is to beat them to the punch. Check over your own lathes. How do they match up . . . in output? . . . in finish? . . . in tool wear and breakage? . . . in scrap losses and rejects? . . . in unit cost? Are they capable of maximum cutting speeds on high-Brinell steels, non-ferrous metals and plastics? What do they offer in the way of labor-saving improvements . . . in automatic operation?

If there is any doubt in your mind, call in a Lipe engineer. Let him show you how the Lipe Carbo and the Lipe Carbo-Matic will fit into your plans. It costs nothing to find out.

LIPE
CARBO-MATIC LATHE

is a high-speed, fully-automatic lathe designed for battery operation by one operator. Hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8", between centers 30".

LIPE CARBO LATHE

has rugged massiveness for extreme rigidity . . extra power for deep, fast cuts . . . and smoothne that reduces tool breakage and increases tool wea Has the high spindle speeds required for efficie carbide-tool turning. Cuts range from 0.003" to 0.30 Swing over bed 12", between centers 18".

LIPE LATHES MADE BY LIPE-ROLLWAY CORPORATION, Syracuse, N.

ALCO
DRILL CHUCKS

COMPLETE RANGE OF SIZES FOR DRILLS FROM 1/32" TO 1"

ALCO Drill Chucks fit all screw machines . . . Drills are held securely without the use of bushings . . . Full floating feature of the holder insures concentric drilling even on your old machines . . . Each ALCO Drill Chuck has a wide range of adjustability so that one chuck will hold various sizes of drills . . . Produce perfect work faster.

•

DON'T OVERLOAD YOUR TOOL ROOM WITH RUSH ORDERS FOR DRILL BUSHINGS - - - USE ALCO DRILL CHUCKS WHICH HOLD DRILLS SECURELY *without bushings*. MODERNIZE ALL YOUR MACHINES NOW WITH ALCO TOOL HOLDERS.

Send for Complete Catalog

ALCO EFFICIENT TOOLS

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Detroit Office: 2441 Field Ave., Phone DIXson 2434
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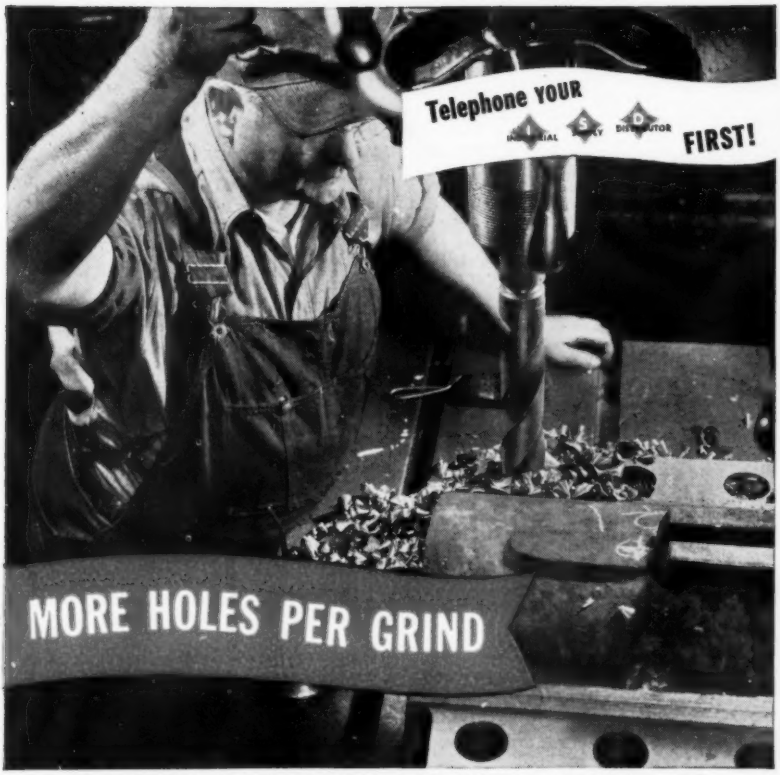

with CLE-FORGE HIGH SPEED DRILLS

● CLE-FORGE Drills are not only the finest twist drills you can buy, but also are the most economical. Figured on the basis of *cost per hole*, they give the biggest dollar value. The same economy can be obtained with other CLEVELAND tools—Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills and Counterbores.

The CLEVELAND TWIST DRILL COMPANY
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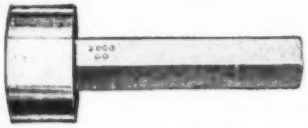
STANDARD CYLINDRICAL PLUG GAGES



"GO"

"NO GO"

SIZE NO GO	LIST PRICE	SIZE NO GO	LIST PRICE	SIZE NO GO	LIST PRICE	SIZE GO	LIST PRICE
.1275	$4.50	.6573	$4.90	1.0951	$5.50	.129	$5.10
.130	4.50	.6729	4.90	1.1107	5.50	.2080	4.70
.1708	4.30	.6886	4.90	1.1264	5.50	.2120	4.70
.2021	4.20	.7043	4.90	1.1420	6.30	.3260	4.70
.2086	4.20	.7355	4.90	1.1576	6.30	.3451	4.70
.2177	4.20	.7484	4.90	1.1732	6.30	.370	5.10
.2195	4.20	.7504	4.90	1.1816	6.30	.4062	5.10
.2351	4.20	.7504	4.90	1.2045	6.30	.4364	5.10
.2664	4.20	.7512	4.90	1.2201	6.30	.4920	5.10
.2820	4.20	.7668	4.90	1.2670	6.30	.495	5.10
.2976	4.20	.7824	4.90	1.2826	6.30	.5156	5.60
.3263	4.20	.7980	4.90	1.2982	6.30	.5250	5.60
.3290	4.20	.8293	5.50	1.3295	6.30	.5781	5.60
.3446	4.20	.8449	5.50	1.3607	6.30	.5925	5.60
.3453	4.20	.8605	5.50	1.3755	6.30	.6000	5.60
.3602	4.20	.8666	5.50	1.3786	6.30	.6150	5.60
.3720	4.50	.8762	5.50	1.3921	6.30	.6248	5.60
.3915	4.50	.8913	5.50	1.4077	6.30	.6290	5.60
.4227	4.50	.8918	5.50	1.4233	6.30	.6291	5.60
.4368	4.50	.9074	5.50	1.4390	6.30	.6299	5.60
.4395	4.50	.9230	5.50	1.4546	6.30	.6300	5.60
.4541	4.50	.9387	5.50	1.4702	6.30	.7498	5.60
.4853	4.50	.9454	5.50	1.4858	6.30	.7500	5.60
.4924	4.50	.9544	5.50	1.5005	6.30	.8125	5.60
.497	4.90	.9694	5.50	1.5015	6.30	.8281	6.20
.5300	4.90	.9700	5.50	1.5754	8.50	.8437	6.20
.5478	4.90	.9856	5.50	1.8445	9.60	.8659	6.20
.5930	4.90	1.0013	5.50	1.8510	9.60	.9687	6.20
.6010	4.90	1.0163	5.50	1.8756	9.60	.9843	6.20
.6156	4.90	1.0241	6.49	1.8758	9.60	1.0400	6.20
.6254	4.90	1.0325	5.50	1.9072	9.60	1.1248	6.20
.6294	6.08	1.0404	5.50	2.051	10.60	1.4995	7.10
.6295	4.90	1.0481	5.50	2.4417	11.70	1.5746	9.60
.6303	4.90	1.0638	5.50	2.8355	13.80	1.8748	10.80
.6305	4.90	1.0795	5.50	3.1505	14.80	2.0470	12.00
.6417	4.90					2.8344	15.60

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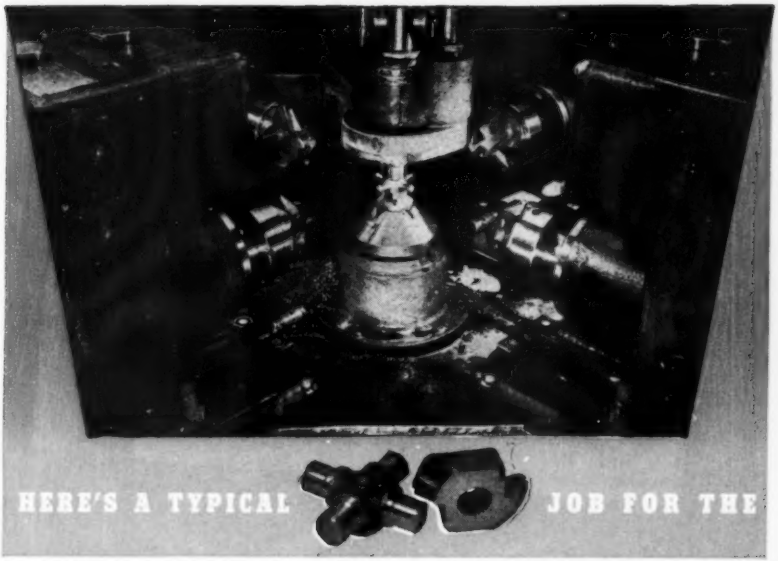
We carry a complete line of H.S. Drills, Milling Cutters, Lathe Tools, H.S. & C.S. Taps & Dies, Drill Chucks, Lathe Chucks, Files, Special Taps & Dies



VERS-O-TOOL

Forming cuts are taken on all four arms of this differential trunnion—*simultaneously*—to produce 225 pieces per hour. That's *production!*

Operating with spindle speeds of 400 rpm and a feed of .010, these Vers-o-tools finish each forging to the same close tolerances, hour after hour.

Whether you're threading, end turning, forming, knurling, burnishing or performing a combination of these operations, circular ground chasers and circular cutters are accurate to the original limits for every regrind. Duplicate sets may be substituted in less than one minute and without disturbing the setup. There's no sacrifice of operator's time—no "cutting and trying". You'll save both time and material.

Instead of one cutting edge there are four. Circular chasers and cutters may be reground through 270° circumference.

Be sure you have complete, up-to-date information. Ask for catalog D-42-C.

The NATIONAL ACME CO.

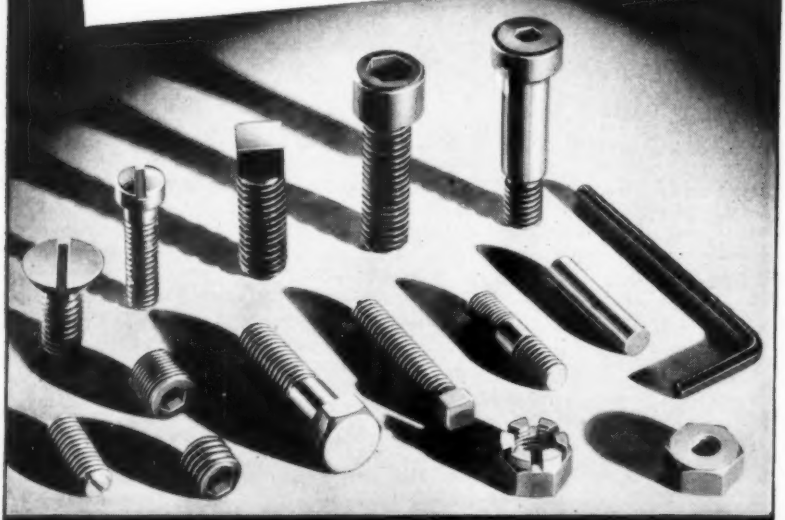
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

All Of One Quality
The Finest!

Chicago Standard Screw Products are manufactured from finer materials and are unsurpassed for their increased strength, greater accuracy and perfect uniformity. In your present plans for increased production—try "Chicago Screw"—manufacturers of precision-made Standard Screw Products.

These Fine Products are sold only thru Authorized Distributors



THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 So. Homan Avenue Chicago 24, Ill.

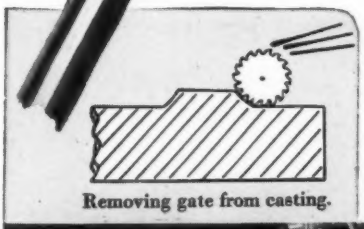
The Right BUR for the Job

Supplied with or without end cut . . . in diameters of 1/8", 1/4", 3/8", 1/2", 5/8", 3/4" — fine, medium or coarse cut.

FOR FAST, SMOOTH, IDEAL RESULTS

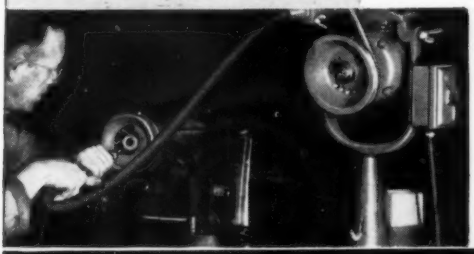
Shape "A"

Ground-from-the-solid Straight Cylindrical



Removing gate from casting.

This P&W KELLER Bur is especially recommended for such operations as removing flashes and gates from castings where full-length contact of bur is required. Shape "A" is also best for blending radii of corners of straight or curved contours, chamfering of irregular shaped edges, and cutting sharp inside corners where accessible. For dependable, smooth-running, long-lived service, always specify Pratt & Whitney KELLER Burs. Write for full information on this and other P&W burs.



Operator shown removing surplus cast iron from casting with a Kellerflex Flexible Shaft Machine using an "A" bur.

PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DEPARTMENT
WEST HARTFORD 1, CONN.

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12% COBALT "CUSHIONED" SOLID H.S.S. TOOL BITS
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are well beyond our present manufacturing facilities.

WE ARE SORRY

to advise firms who have already placed their orders for these tools, that shipping dates will be more extended than we would like.

We can promise prompt shipment of approximately 20% of your order with the remainder to follow as quickly as our production schedule will permit.

THIS AVALANCHE OF ORDERS HAS NECESSITATED THE FOLLOWING STEPS

1—**A NEW PLANT HAS BEEN PURCHASED AT GREAT MEADOWS, N. J., WHICH WILL PROVIDE SIX TIMES OUR PRESENT FLOOR SPACE.**

2—We are purchasing **$250,000.00** worth of **Brand New Machine Tools** in order to **speed up production.**

3—We are employing a firm of prominent Industrial Engineers to help us with our unexpected problems.

Once these new facilities are in operation, we will again be able to advise good delivery dates.

We suggest that those who wish to give these superior tools a trial, that orders be placed with a minimum of delay.

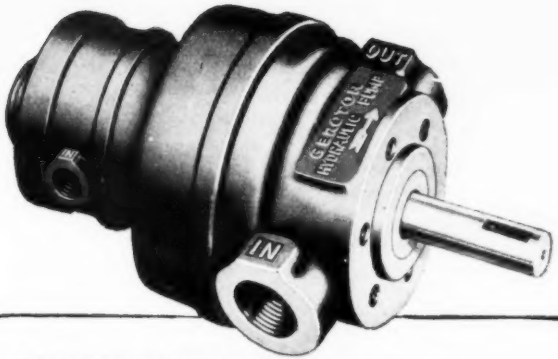
Literature covering our entire line will be sent upon request.

Visit our Booth, C-706, National Metal Exposition, Cleveland, O., and see **Revolutionary Developments** in the **Cutting Tool Field,** including milling cutter bodies, milling cutter blades, tool holders, new type circular form tools 6" and 12" grinders, etc.

General Tool & Die Company Inc.

555 Prospect Street **East Orange, N. J.**

Phone Orange 5-2500



GEROTOR DOUBLE UNIT PUMPS

DON'T HAVE A ONE TRACK MIND

They're really VERSATILE!—precision engineered for a wide variety of applications using hydraulic oil circuits. That's one of the reasons why you'll find Gerotor pumps specified as standard equipment on many important industrial machines.

This double unit model supplies two separate oil flows, and the flexibility is such that each pump section has its own independently controlled output.

If you have a pump problem that calls for versatility—as well as dependability—call for

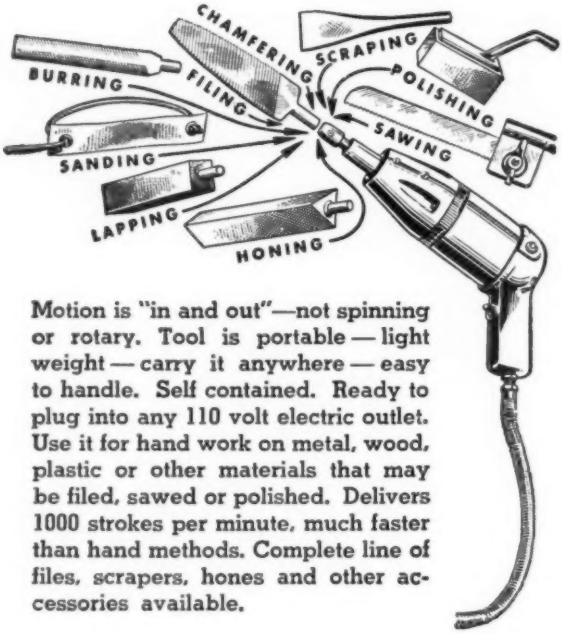
GEROTOR

GEROTOR MAY CORPORATION • BALTIMORE 3, MD. • Plants at Logansport, Ind. • Baltimore, Md.

For SPEED and PERFORMANCE!

Reciprocating Action (In and Out)

PORTABLE *Electric* H & H TOOL



Motion is "in and out"—not spinning or rotary. Tool is portable — light weight — carry it anywhere — easy to handle. Self contained. Ready to plug into any 110 volt electric outlet. Use it for hand work on metal, wood, plastic or other materials that may be filed, sawed or polished. Delivers 1000 strokes per minute, much faster than hand methods. Complete line of files, scrapers, hones and other accessories available.

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use these STANDARD "LOGAN" Components

for your COMPLETE AIR AND HYDRAULIC SYSTEMS

Co-ordinated units designed and built by one manufacturer

AIR AND HYDRAULIC OPERATED CHUCKS

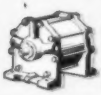
Logan power-operated chucks permit fast, positive, accurate chucking by operating a convenient control valve. Production is profitably increased . . . idle machine time reduced . . . operator fatigue minimized. High accuracy and finish are obtained. Constant, equalized jaw pressure with follow-up eliminates spoilage. (*Write for Catalog 70-1.*)

ROTATING CYLINDERS

These Logan double-acting air and hydraulic cylinders are designed especially for mounting on rotating machine spindles.

NON-ROTATING CYLINDERS

For pushing, lifting, pressing, holding, pulling, clamping and other power movements in any direction. Positive, uniform actuation; high accuracy and speed.



AIR CYLINDERS

Logan air cylinders provide rapid response and maximum power without leakage. Cushioned if desired. (*Write for Catalog S-25.*)

NEW *Rotocast* HYDRAULIC CYLINDERS

Clean, true bores in *centrifugal cast* barrels; 4 automotive-type piston rings. Cushioned if desired. (*Write for Catalog 84.*)

NEW LOGAN *Air-Draulic* CYLINDERS

Powered by air; self-contained hydraulic *regulating* circuit provides controlled feed. Smooth, uniform operation. (*Write for Catalog 471.*)

SPECIAL MACHINES DESIGNED AND BUILT

Logan SAVES TIME · EFFORT · MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC. 803 CENTER AVE. LOGANSPORT INDIANA

DIVISION · CYLINDERS · VALVES · PRESSES · SURE-FLOW · HYDRANT PUMPS

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1. INCREASED SPEED
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4. SIMPLIFIED CONTROL
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7. REDUCED SPOILAGE AND SAFER OPERATION
8. IMPORTANT SAVINGS IN TIME AND EFFORT

AIR AND HYDRAULIC VALVES

Complete line for hand, foot, electric solenoid, cam, pilot and latch-operated control. (*Write for air valve Bulletin 371; hydraulic valve Catalog 80, Section 3.*)

AIR-OPERATED VISES AND FIXTURES

Quick-acting and accurate . . . help to increase output, improve precision and reduce costs. Standard vises available. Fixtures designed and built to your order. (*Write for Catalog S-25.*)

HYDRAULIC POWER UNITS

Self-contained units ready for connection to your circuit. Positive, uniform, controlled pressure. Pump, valve and piping are enclosed for protection . . . all parts readily accessible. (*Write for Bulletin 581.*)

Collet Grip STEEL TUBE FITTINGS

For permanently leak-proof, vibration-proof tube connections. Grip tube without digging . . . relieve vibration at flare. Can be re-used. (*Write for Catalog 44.*)

HYDRAULIC AND AIR PRESSES

Standard air-operated arbor presses; standard high and low platen hydraulic presses. Special presses to fit requirements. (*Write for Catalog 51.*)

NEW *Sure-Flow* COOLANT PUMPS

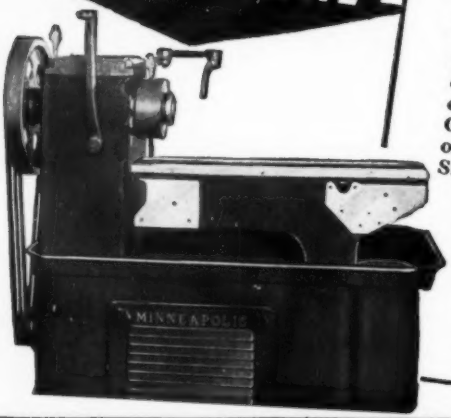
Safely handle liquids containing abrasives. Self-priming without submerging types. Splash-proof motor . . . integral motor drive. (*Write for Catalog 62.*)

Free ENGINEERING HELP

For designing complete air and hydraulic systems. Layouts furnished. No obligation for this service.

WHY BUY LATHE PARTS YOU NEVER USE? Consider this ECONOMY set-up!

Here's the BASIC LATHE

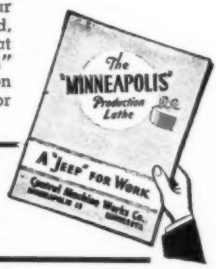


ADD Your Choice of Drives and Equipment

Single speed, four speed, all-electric multi-speed and low speed chain drives.
Manual or air operation of collet, expanding mandril or chuck.
Cross-slide with hand screw or rack and pinion feed.
Six station flat turret and self-indexing stop.
Manual capstan operated carriage.
Power feeds for turret, carriage or cross-slide.
Special equipment designed for your work.

"BASIC UNIT + PARTS" PLAN of the MINNEAPOLIS PRODUCTION LATHE

You can save money on production lathes — and further hold down your cost by adding only the equipment needed for your particular job! When you buy the MINNEAPOLIS Lathe, you get a high speed, heavy duty model with large spindle capacity — a machine that takes heavy cuts without "chatter" and increases your output. 2¼" Spindle capacity, 14" swing, 4 different drives. Let us quote you on a "tailor-made" lathe for your work. Simply send sample part or drawing.



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WILL VERY SOON WRITE ITSELF OFF!

No. 103 HEAVY DUTY VERTICAL SURFACE GRINDER

Not all competition is "cut throat." Some figure better than others. Some use more efficient machines. Some *do both*, and they're dangerous. Fight fire with fire. Back up your estimators with the best machinery you can get. The better the equipment, the cheaper the cost per piece. In metal removal, there is no substitute for quality! Representative of such quality is this heavy duty vertical surface grinder. It produces flat surfaces with precision and speed. Large table capacity. Hydraulic operation. Controls and adjustments all in easy reach. Ample bearings. Plenty of reserve power. Glad to explain fully on request.

Meet BUXITE →

A new "case hardening" process for all types of abrasive wheels. Grinds carbide and cast alloy cutting tools at 5 to 20 times lower cost. Less heat. Finer finish. No "loading." If you grind superhard tools and materials, get the thrilling story of BUXITE.

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport

GRINDERS • GRINDING WHEELS • BUFFING LATHES

FOR PRODUCTION LOTS . . . OR SINGLE PIECES

Model 4½-S

Save Time On Single Pieces

Enco Lathe Turrets

When your lathe job calls for one or two of a kind, don't change tools! Use an Enco 12-station turret tool post as an all-purpose tool holder. The Enco Turret mounts rectangular and square tools and standard boring bars and cut-off blades.

Your most frequently used tools (facing, turning, threading, boring, etc.) will remain in the turret. On center at all times and ready for use — just waiting to help you cut lathe time. No costly tool switching and re-centering of tools. This saving of time will pay for the turret many times over.

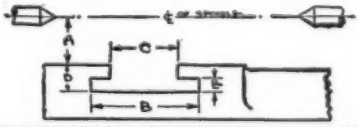
"A" dimension range (From diagram on this page)	MODEL 6-S 2" to 3-1/8" incl.	MODEL 4½-S 1-9/16" to 2-1/2" incl.	MODEL 3½-S 1-1/8" to 1-3/4" incl.	MODEL 2½-S 7/8" to 1-5/16" incl.	MODEL H 7/8" to 1-5/16" incl.
LATHE SWING	16" SWING & UP	13" to 16" SWING	10" to 13" SWING & BENCH LATHES	BENCH LATHES	BENCH LATHES
TOOL SIZE RANGE	5/8" to 1-1/4" or No. 2 toolholder 3/8" square bit — High speed or carbide. (Where no tool bit size is specified, turret will be furnished for No. 2 Tool Holder.)	3/8" to 3/4" (Where no tool bit size is specified, turret will be furnished for 3/4" tool bit.)	1/4" to 1/2" (Where no tool bit size is specified, turret will be furnished for 1/2" tool bit.)	1/4" to 3/8" (Where no tool bit size is specified, turret will be furnished for 3/8" tool bit.)	1/4" to 3/8" (Where no tool bit size is specified, turret will be furnished for 3/8" tool bit.)
SPECIFICATIONS	4 tool, 12 positions 6" square Mac-ita Tool Post Screws Packed in crate Shpg. wt. 37 lbs. **Price $99.00**	4 tool, 12 positions 4-1/2" square Packed in carton Shipping weight 16 lbs. **Price $49.50**	4 tool, 12 positions 3-1/2" square Packed in carton Shipping weight 8 lbs. **Price $35.00**	4 tool, 12 positions 2-1/2" square Packed in carton Shipping weight 4 lbs. **Price $23.00**	6 tool, 12 positions 2-3/4" hex Packed in carton Shipping weight 4 lbs. **Price $25.00**

Prompt delivery on all Enco Lathe Turrets. When ordering, give all dimensions and tool size.

COMING SOON!

ENCO'S "HEX"—the Better Bed Turret—moderately-priced, precisely manufactured and designed for long, carefree use. Write for complete details.

Write Department 21



Make of Lathe and Size	A	B	C	D	E	Maximum tool size desired

Ask for catalog showing 30 models for all lathes.

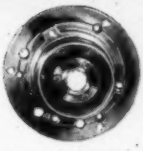
ENCO MANUFACTURING COMPANY

General Office and Factory: 4522-24 Fullerton Avenue, Chicago 39, Illinois

On Small Parts DRILLING *and* TAPPING

Steel punching with 7 tapped holes. Job is done in 2 operations, 2 parts at a time.

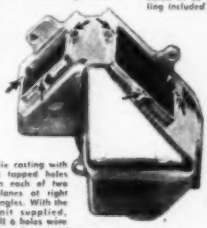
This part with 54 holes including counterboring, is also done in quick time on a head with indexing fixture.



This part is done in the head and indexing fixture unit shown below. Its 16 holes are drilled and some counterbored in 30 seconds, handling included.

This part with 4 holes is handled same as part at right—with pressure pad and bushing plate method.

Screw with 2 spanner wrench holes. Parts are loaded in a nest—locating and clamping is automatic—drilling is done at 3000 r.p.m.



Die casting with 3 tapped holes in each of two planes at right angles. With the unit supplied, all 6 holes were tapped at one time.

This part also requires the indexing fixture method. 13 holes are drilled and some are reamed and counterbored.

Die casting with 8 multiple reamed holes. Parts are simply placed in a nest and reamed.

Ettco-Emrick

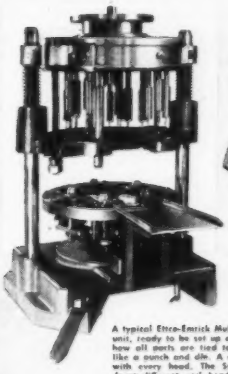
will tool you up for top production at bottom cost

You just send us a sample part or drawing and tell us the production you want. We supply you with Multiple Spindle Head and Fixture Units which you simply set up on your drill presses. They are engineered for fast handling of the part and for drilling or tapping the maximum number of holes at every stroke of the press—with features that make it possible for unskilled labor to do the work.

The parts shown are typical of the thousands for which we have tooled up manufacturers throughout the country, including most of the big fellows. Because Ettco-Emrick units are made of standardized parts, their cost is low—and you get it back in quick time by savings in labor and machine hours. For more details and examples write for the *"MULTIPLE HEAD REPRINTS."*

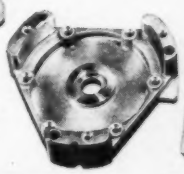
ETTCO TOOL CO.

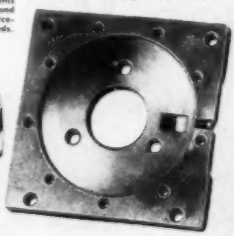
596 Johnson Ave., Brooklyn 6, N. Y.



A typical Ettco-Emrick Multiple Head and Fixture unit, ready to be set up on the drill press. Note how all parts are tied together by guide posts like a punch and die. A quill clamp is supplied with every head. The System includes over a dozen different work handling methods.

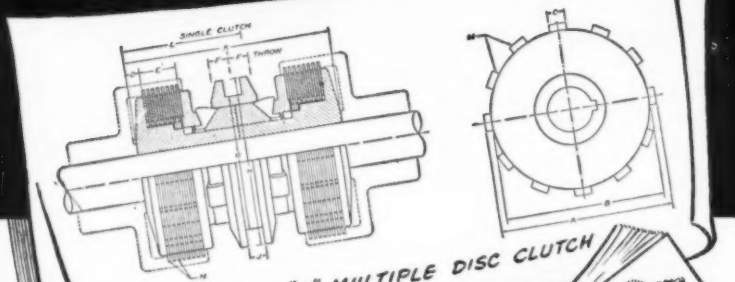
The 18 drilling, 27 countersinking, 3 counterboring and 12 tapping operations on this die-cast aluminum cover and body are done on Ettco-Emrick units in 90 seconds.





The 16 holes in the part below are drilled and tapped fast and sure on a combination unit with sliding carriage fixture.

A HANSON TRIUMPH... THE MULTIPLE DISC FRICTION CLUTCH



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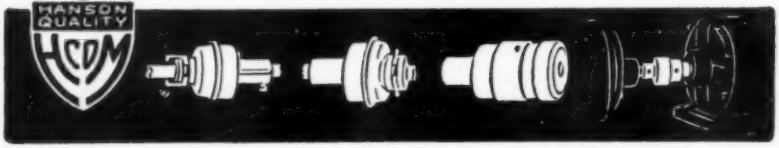

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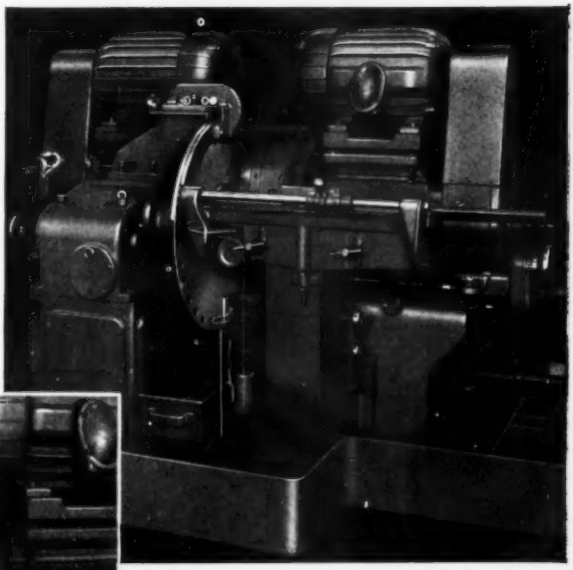

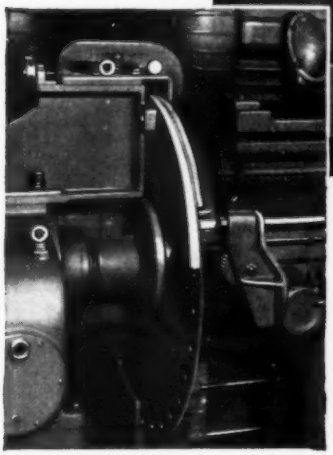

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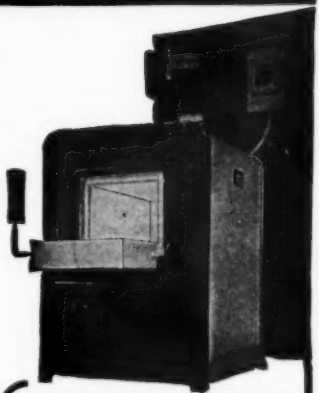

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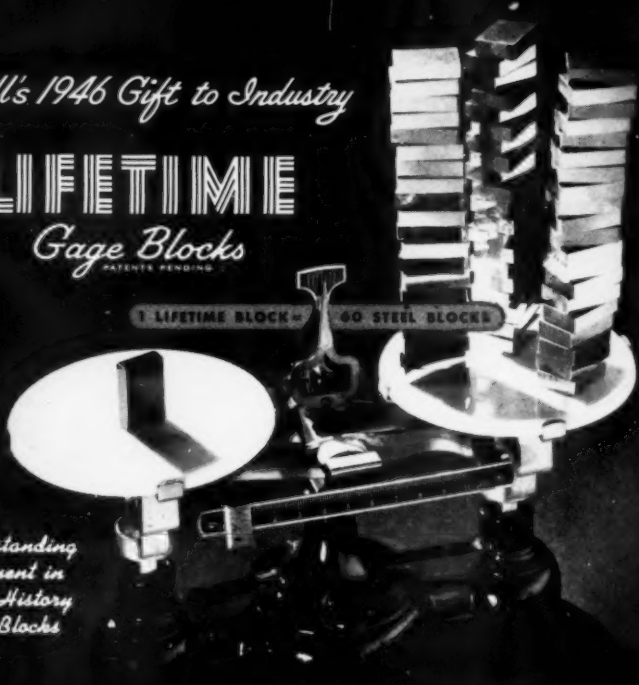

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Featured In This Issue

GRINDING WHEELS can be manipulated, within considerable limits, to give the cutting action required. This technique is helpful when the exact type of wheel wanted is not available. John F. Fischer of the Abrasive Co., tells how it is done in the story commencing on page.....137

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DIMENSIONAL CONTROL and its importance as a production factor is emphasized in Gerald E. Stedman's story on recent accomplishments at the Woodworth plant, in the story commencing on page.....149

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TRENDS point to Speedier Boring with Carbide Tools; Faster Milling with a new cutter technique; and more intensive study devoted to Handling Methods. All of these, with an interesting survey bearing on machine tool sales are presented in the section commencing on page.....164

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GEAR FINISHING and some newer developments in the art are discussed by John E. Hyler in the story beginning on page.....199

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BALLS have many other machine tool applications in addition to their use as bearings. Part IV in the series of articles by H. F. Williams, illustrates and describes many additional uses of the versatile ball. See page.....213

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GEAR CHANGE RATIOS with particular applications to Thread Grinding are discussed by John W. King. He gives all the figures for four popular ratios and shows just how to work them out. See page.....243

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"WAITING TIME" by Leo J. St. Clair, analyzes a tough problem that has hampered many salesmen—time lost "cooling heels" in lobbies. In this particular instance, a cure was effected—and the remedy may help in other chronic cases. See page.....255

BALLS IN DESIGN is a brief review of several uncommon machine applications by John E. Hyler. See page.265

•

BROACHING has shown the way to speedier, more economical production in many lines. In this particular instance, the job was on clutch discs and the saving was worth while. For the story, turn to page.....267

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AUTOMATIC WELDING has brought new standards of production speed and economy in many fields. It is being used successfully in the fabrication of automatic boilers and the story is presented on page.....271

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THE INFLATION BOGEY is discussed by Arthur Roberts in his series of articles on tax problems. Turn to page 274

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COLOR as a Science is discussed by E. D. Peck of Pittsburgh Plate Glass Co. He traces the gradual understanding and appreciation of the effects of color values in an interesting story beginning on page.....283

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"LET'S TALK SHOP" is the regular section devoted to shop notes and tips. Turn to page.....291

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WHAT'S NEW offers the monthly collection of articles describing new machines and equipment, beginning on page 298

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MECHANICS Thru the Ages—the monthly picture feature appears on page 408

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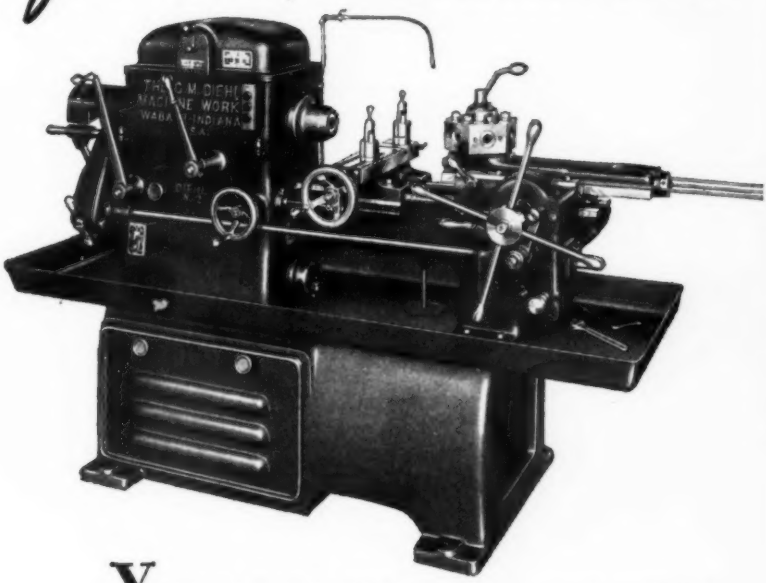
PRODUCTS INDEX—First Aid in locating new equipment items—Turn to page 410

Use DIEHL TURRET LATHES for those Production Jobs



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AS THE EDITOR SEES IT

WHILE the shooting continued, "Merry Christmas" and "Happy New Year" sounded rather hollow. In our first peacetime celebrations, there was more of the old-time holiday spirit.

We still have the aftermath of war . . . but many of the boys are home . . . many more are on the way or will be soon.

There's plenty of turmoil and strife in the outlook ahead . . . as we wind up unfinished business and strive to insure against future conflicts.

Eventually the industrial picture here at home will tend to brighten. Sooner or later, labor will realize that everybody loses during industrial doldrums. Some good old fashioned teamwork and cooperation will produce some profits to split four ways . . . with labor, management, the stockholders and the ultimate purchasers of the products.

There's an obligation for labor to produce more per man-hour . . . and for management to provide more efficient equipment and pay incentives to make that possible. Wage incentive plans that insure industrial harmony have been tested down thru the years . . . and there have been no strikes at these plants.

In the matter of improving production equipment, we can take a lesson from the Germans. We had some thoroly modern plants which turned out prodigious quantities of war materiel. By and large tho, our plants were equipped with aging and near-obsolete machines. Yankee productive skill plus multi-shift operation of these old machines made it possible for us to turn out the weapons that overwhelmed the axis.

At war's end, Germany had an amazing volume of machine tool equipment. George H. Johnson, President of Gisholt Machine Co., and a member of the U. S. Reparations Committee estimated that not over 15% of Germany's tool equipment was damaged beyond reasonably simple repair.

He stresses that because of this ample and efficient machine tool equipment, the German armament factories operated only one shift per day, while we worked around the clock.

Why the difference?

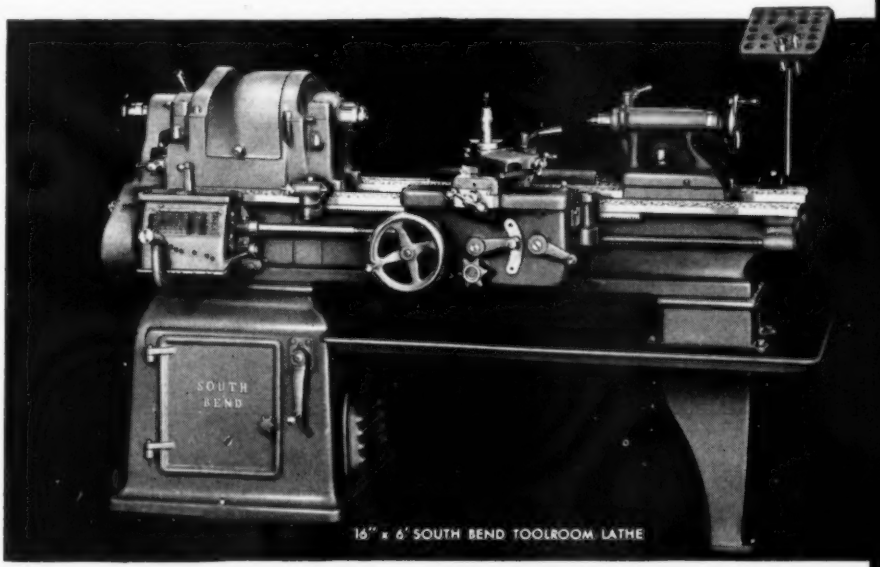
A lot is explained by the German government's taxation and depreciation policies. German manufacturers were encouraged to write off new equipment rapidly. Our manufacturers have not been permitted to recover the cost of productive equipment from the price received from the sale of products except on a very slow and tardy basis.

As a result Germany had more good machine tools in proportion to its output, its population and the scope and size of its plants than we had in this country.

A more liberal government policy on tool depreciation would provide a powerful incentive for modernizing our national production plant.

Wesley G. Paulson

South Bend Lathes



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Manipulating a Grinding Wheel

To Alter Its Grinding Action

By JOHN F. FISCHER*

T is seldom economically feasible for a job shop to carry an inventory of all wheels that it might conceivably need. Also, as we have seen, a wheel of the specifications listed in a table of wheel recommendations for a certain job may not perform perfectly when used on that job in the shop, due to the fact that the type or condition of the machine, or other factors, may be somewhat different from those most commonly found, which are those used in drawing up tables of wheel recommendations.

It is therefore often necessary to try to make a wheel, that is the wrong wheel for the job, give the right results. Fortunately, if the wheel is not too far off in specifications, that can be done by manipulating it. That ability is a sure mark of the skilful grinding operator.

In acquiring the knack of manipulating or "babying" a wheel, nothing will take the place of experience. But the necessity of using green operators on wartime production has proved that most men can learn any knack more quickly if they are first taught the reason why wheels act as they do. Knowing and understanding these factors,

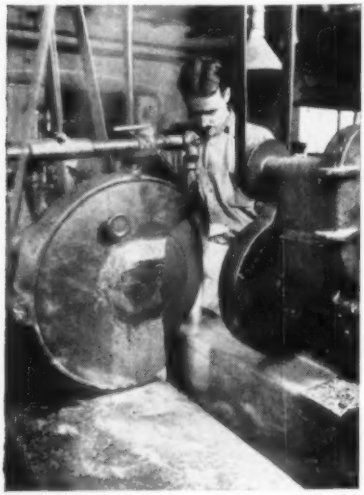
*Manager, Sales Engineering, Abrasive Company

When internal grinding, the most effective way to alter wheel action is by manipulating the traverse rate.

less actual experience is needed to make a greenhorn into a reasonably skilled grinding machine operator.

If a wheel is made of the wrong abrasive type of bond, it is usually necessary to get another wheel. However, to some extent, a wheel of the wrong grit size can be made to give better surface quality or faster material removal, and a wheel that is too soft or too hard in grade within reasonable limits, can usually be made to act as tho it were of the right grade—or very nearly so.

Here is why. Assuming that the abrasive is of the right kind for the material being ground, the abrasive grains in a wheel perfectly suited to the job will be held in the bond so long as they are sharp. When they become too dull to cut properly they will either fracture and so present new cutting edges to the work or, because of the increased stress due to their dullness, be pulled out of the bond and new sharp grains will be presented to the work. In short, a wheel perfectly suited to the job will be, as the saying is, "self-sharpening". While widely used, that is not an exactly correct statement, for under many conditions it is necessary to dress a wheel—which is in effect sharpening it.



Where fine surfaces are required, as on this roll grinding job, it may be necessary to add wheel dressing to the bag of tricks to get just the wheel action wanted.

With this exception, the bond strength of a wheel should be so accurately balanced with the stresses set up in its face that a slight decrease in the stresses will cause the grains to dull yet remain held in the bond and the surface of the wheel to glaze. On the other hand, a slight increase in the stresses will fracture the grains or pull them from the bond before they have become too dull to cut satisfactorily. In the first case the wheel acts too hard; in the second, too soft. If too hard, the wheel is inefficient as a material remover and may burn the work; if too soft, the wheel wears too rapidly and may cause surface blemishes such as wheel and grit marks.

From this it is obvious that it is possible to make a wheel act softer or harder than its rated grade by so manipulating it and the work as to increase or decrease the stresses set up in it. The stresses are impact, compression and shear.

The magnitude of these stresses depends upon the physical characteristics of the work material, such as hardness and toughness; the area of contact between wheel and work; the amount of infeed; the ratio of wheel speed to work speed in surface feet per minute; and the rate of traverse.

Obviously, on a given job nothing can be done about the work material. For a given wheel and work-piece the area of contact can be altered only by increasing or decreasing the rate of infeed—that is, the depth of cut. So, changing the grade action of a wheel by changing the stresses is accomplished by manipulating the infeed, wheel speed, work speed and traverse.

The following suggestions on manipulating a wheel apply to cylindrical, flat surface and internal grinding.

It is important to remember that when we speak of manipulating any one of the factors, it is assumed that

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all the others are remaining constant. Actually, in practice it is often necessary to manipulate several of them in order to get stress changes—either up or down—of the amount required.

The area of contact between wheel and work is important because it determines the unit compressive stress for any given total pressure between wheel and work. If the area is small, the unit pressure carried by each abrasive grain will be greater than if the area is large, and the wheel will break down faster and the wheel will be said to act "soft". The area depends upon the diameter of the wheel and work and the depth of feed. The first two cannot be manipulated once the wheel is in operation, so manipulation must be by infeed. Increasing the infeed increases area of contact and so reduces the unit stresses. But at the same time there is a greater or a lesser degree of contrary action due to the increased shearing stress caused by the larger chip that is taken with deeper infeed.

It is to be noted that altho it is not practical to manipulate the area of contact by changing the diameter of a given wheel, actually the wheel diameter is constantly being reduced by wear. It is often desirable to offset the resulting decrease in stress due to increased area of contact by manipulating some of the other factors. Because the compression and shear stresses due to increased infeed usually far more than offset the effect of the increased area of contact, the net result of increasing infeed is to make a wheel act softer and of decreasing it to make a wheel act harder.

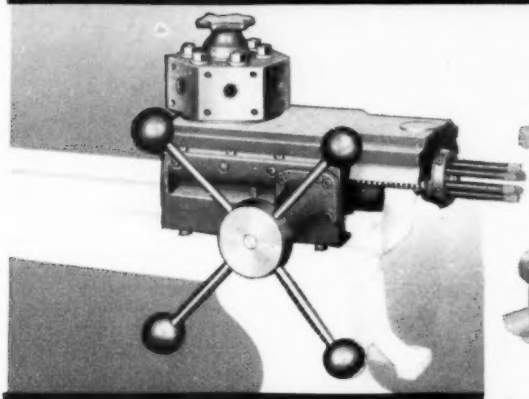
The widest latitude for manipulation in making a wheel act harder or softer than its real grade is in altering the ratio of wheel speed to work speed. Theoretically—and to a great extent practically—it makes no great difference at what speed either the wheel or work operates, so long as the ratio of speeds does not change. Actually, of course, there is a top limit of wheel speed dictated by safety considerations, and a top limit to work speed determined by vibration. Also, to reduce either speed to an extreme amount will greatly reduce production. However,

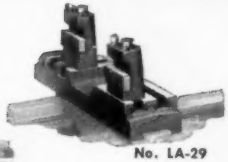
In cylindrical grinding, the operator can juggle wheel speed, infeed and traverse to get the grinding action he wants.

very slow work speeds are often used to obtain unusually fine surface finishes when speed of material removal is of secondary importance.

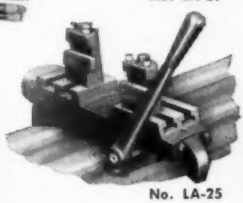
Whether we consider cylindrical, flat surface or internal grinding, this holds true:—When a wheel is revolving and the work surface is moving in the opposite direction, a particle of abrasive grain is in contact and cutting for a length of time determined by both wheel speed and work speed. If wheel speed is unchanged, increasing the work speed will lengthen the time a grain cuts during each wheel revolution. It is under a greater stress for a longer time, and the grain is therefore torn from the bond sooner—which is to say that the wheel acts softer. Now suppose, on the contrary, that wheel speed remaining constant, the work speed is reduced. The chip will be shorter, and so will the time each grain cuts during each wheel revolution. The stresses are less, the grain is held by the bond longer, and the wheel acts harder.

Logan A NAME TO REMEMBER WHEN YOU THINK OF **BETTER** LATHES





No. LA-29



No. LA-25

Double Tool Post Cross Slides

For use in connection with the Turret Assembly. No. LA-29 is interchangeable with the Compound Rest. No. LA-25 also fits the bed of all Logan Lathes.

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No. 820 Quick Change Gear Lathe

No. 840-2 Quick Change Gear Turret Lathe

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Illustration: Model 5-D-1, light duty Stroke Counter installed on Delta Drill Press gives operator precise count of work turned out.

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It is easy to see that exactly the same effects are produced if the work speed is held constant and the wheel speed manipulated. Increasing the wheel speed increases the wheel-to-work speed ratio just as does reducing the work speed with the wheel speed constant. And vice versa.

Of least effect in changing the action of a wheel as regards apparent grade is traverse—except in internal grinding. A fast traverse increases stresses and so makes a wheel act softer. Reducing traverse rate makes the wheel act harder. The top limit for traverse is of course the width of the wheel per revolution of the work. Faster than that will grind a spiral pattern on the work. In cylindrical and flat surface grinding more grade effect can be obtained by manipulating infeed or wheel-to-work speed ratios.

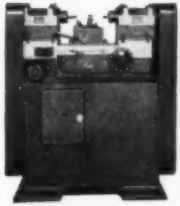
The contrary is true in internal grinding. The most effective manipulation here is of traverse speed.

So far we have considered only the manipulation of speeds and feeds to alter the cutting action of a wheel from what its specifications would lead us to expect from it.

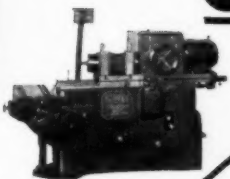
It is also possible to alter its cutting action by skilful dressing. This is especially useful when the available wheel is of the wrong grain size.

Thus, suppose it is desired to make a wheel coarser in order to increase the rate of material removal. This is often done in fine grinding when, to save the time it would take to change from a coarse to a fine grit wheel, a wheel is selected of the right grain size for finishing, but is also used for the roughing grind. To get the coarse effect, the diamond dressing tool is traversed across the wheel face rapidly. This gives the wheel an open pattern which removes stock as rapidly as would much coarser grains. When the finish grind is to be made, the same wheel is dressed with slow traverse and but little diamond infeed. This returns the wheel face to its normal structure. With but little infeed and slow traverse the stock removal will be slow, but the surface finish will be very smooth.

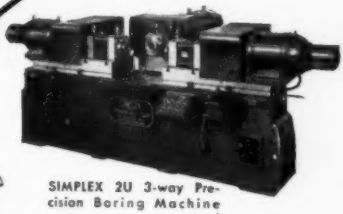
SIMPLEX



SIMPLEX 1LD1 Precision Boring Machine



SIMPLEX 3U Knee Type Precision Boring Machine



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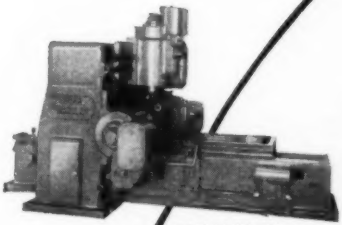

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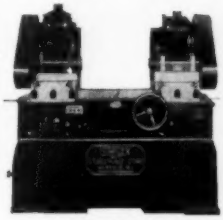

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BELT LACING EQUIPMENT

By using whichever of the two methods of dressing is indicated, a wheel can be made to act as tho it were of two or three grit sizes coarser or finer than actual. Within limits it is also possible to obtain surface smoothness comparable to that which would be provided by several sizes smaller grains, by greatly reducing the work speed for the finishing cut. This is because the grain is in contact with the work for a shorter time, hence the grain marks are shorter, and the surface "smoother".

To sum up these suggestions on how to manipulate wheel and work to get a different wheel action than would be normal for that wheel's grading, let us suppose that an operator is starting a cylindrical job with the best available wheel. Perhaps he knows that it is a few grades too hard. Or he may not be sure at the start, but soon finds that the wheel does not cut normally well, glazes, loads, burns the work, or produces chatter marks on the work.

He will first increase the work speed a very little, keeping all other conditions unaltered. The wheel will at once act softer. But if the grade is so far off that a still softer action is required, he will still further increase the work speed—perhaps to just short of the point where vibration occurs.

If the wheel does not yet act soft enough, the next step usually should be to reduce the wheel speed. But this will reduce production.

He can, if the surface finish requirements are not too stiff, get still softer action by increasing infeed or traverse, or by dressing the wheel more openly. But if finish is important, slow traverse, light infeed and close texture of the wheel face are essential. It is usually best to juggle the wheel and work speeds within proper limits.

If at the outset the operator sees symptoms of the wheel being too soft—such as failure of the wheel to hold its corners or contour; grit marks; too rapid wear; wide irregular marks; or tapered work—he will take the opposite steps. The only one that might seem to be indicated that he cannot use is increasing the wheel speed. Since the wheel speed at the start should have been close to the top safe limit, it should under no considerations be increased.

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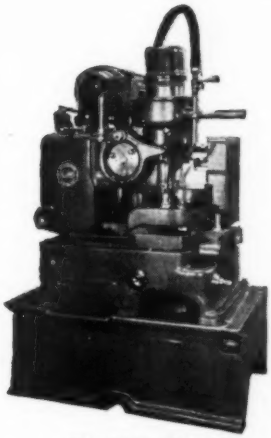

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A technical magazine states that the war-developed arc-oxygen electrode will cut quarter-inch steel plate at the rate of a foot per second while under 40 feet of water. *Metal and Thermit Corp.*

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It is estimated that within a few years 80% of the coal mined underground will be removed from the mines on conveyor belts instead of in cars. *Scientific American.*

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The PV-3 helicopter has a long fuselage with a rotor on each end and carries twelve persons. It is being tested by the Coast Guard and Navy. *Popular Science.*

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A new cement, for use in concrete flooring, is said to drive away insects, kill bacteria, and prevent the formation of molds. It also dissipates static electricity. *H. H. Robertson Co., Pittsburgh.*

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An appliance manufacturer announces an electric washing machine that can also, by the use of attachments, wash dishes, peel potatoes, churn butter, and freeze ice cream. *Hurley Machine Division Elec. Household Utilities.*

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A new gasoline-powered lawn mower resembles a floor scrubbing machine. It is mounted on four wheels and uses a rotary knife revolving at 3,000 r.p.m. *Whirlwind Lawn Mower Corp., Milwaukee.*

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The manufacturer of the jet engine used in the P-80 Shooting Star prophesies that all transcontinental planes will be jet-propelled within five years. *General Electric.*

One of the war devices that may survive to help the motorist is the tire gauge that registers on the dash, developed for the Army's amphibious "duck." *GMC Truck and Coach Div.*

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A magnetic survey of the state of Florida shows large areas in the southern part that are favorable for the occurrence of petroleum. *U. S. Dept. of Mines.*

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Meals are being served in the Naval Air Transport Service that are pre-cooked, packed in a covered paper plate and frozen. On the plane they are thawed and heated in a special oven. *Mazon Sky Plate, W. L. Mazon Corp., 400 W. 34th St., New York.*

Air conditioned trolley cars are being introduced in a Southern city. This is said to be the first use of such equipment in city vehicle transportation. *Atlanta, Ga.-Pullman-Standard.*

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A new household electric light switch can be set for delayed action up to three minutes. *T. J. Mudon Co., 1240 Merchandise Mart, Chicago.*

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Rubber V-belts molded around a steel cable have been developed to replace chain drive on Army motorcycles. *Goodyear, Akron 16, Ohio, Whizzer Motor Co., Los Angeles.*

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Even the common wire nail has been improved. The new type has a notch in place of the point and is claimed to be non-splitting. *E. S. Gair, Snyder, New York, inventor.*

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The 15 operations that form this washing-machine part of B-1112 steel, including rolling the oil groove* in the outside diameter, are performed by the 8-Spindle Conomatic in 12 seconds.

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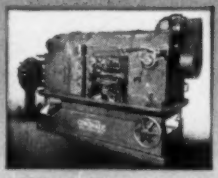

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AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

CLOSER DIMENSIONAL CONTROL

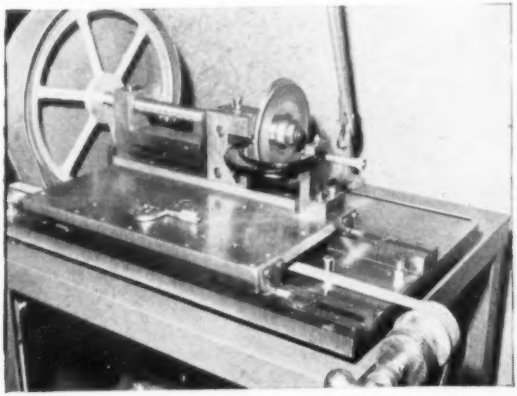
By GERALD ELDRIDGE STEDMAN

ACCOMPLISHMENTS in precision and dimensional control, having approached closer to perfection because of the requirements of war production, can now be expected to result in much more carefully manufactured peacetime products in the years ahead; bringing improved performance, longer life and freedom from vibration that will add much to the use values of their possession.

One of the companies whose accomplishments have been significant in this regard is the N. A. Woodworth Co. of Ferndale, Mich. During the war this firm was a major producer of precision aircraft engine parts for Wright Aeronautical Corp., and its licencees. Mr. Woodworth founded Ex-Cell-O Corporation in 1919 and made it one of the principal precision parts producers of the world, remaining as its President until 1937 when he retired, only to return to industry in 1939 for the organization and development of his present concern.

The Woodworth Co., has pioneered and developed new products and materials which have made many contributions to increased operating efficiency and lowered manufacturing costs. Among such are gages of Cast Stellite Alloy; the Limitrol, a comparator type snap gage; a specially processed alloy for gages known as Nawlide and the Cone-Lok adjustable clamping jig. Along with continuance of aircraft engine parts production and these other products identified with dimensional control, Mr. Woodworth has quite a string of new developments that will soon thrust him importantly into at least five other new post-war industrial fields.

It would be wrong to close my frequent reports of the Woodworth war record without bringing to light certain developments of its engineers in relation to two machines which can have an important part in peacetime production assurance of better dimensional control. I refer to the Micrometer Lap-



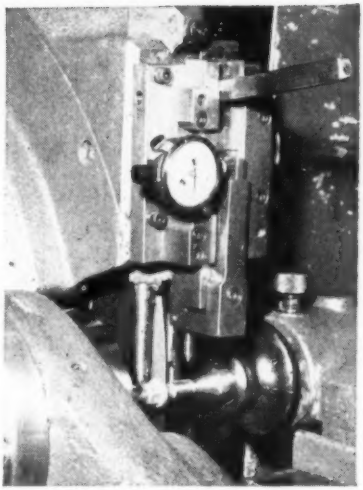
A view of the Woodworth Micrometer Lapping Machine showing the cast iron oscillating lapping wheel and the holding fixtures for Micrometers. The fixtures are mounted on the horizontal table which is actuated by a slip clutch assembly maintaining a light pressure of the work against the lapping wheels. Micrometer stem is clamped in a vee-block and a self-positioning steady rest grips anvil end.

ping Machine and Thread Lead Finder, neither of which have been previously described. I was able to visit the Woodworth plant and observe their values just as the war ended.

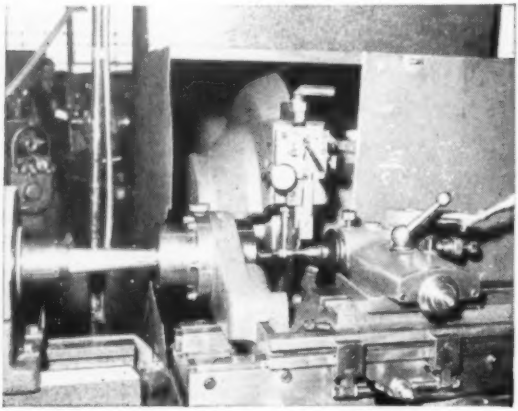
Where tolerances are very close and dimensions are in a few ten-thousandths, even millionths, the very slightest variant can mean the difference between an accepted part and a rejected part. Usually, such parts have heavy amounts of costly machining time that is very expensive to scrap. It is imperative that gaging instruments be kept in perfect condition, accurately to check dimensions on close limits to prevent such wastes.

The micrometer is perhaps the most widely used of gaging tools. It is seldom that any operator does not have use for it. It is a very delicate tool whose contact surfaces, under the most careful of handling conditions, are vulnerable to wearing "off square" thru use. Any jarring or rough usage may hasten its off-square condition or may throw readings out of alignment because of injuries to the spindle mechanism.

For these reasons, it became intolerable to Woodworth engineers to run the risk of inaccurate readings. A system of closely controlled periodic checks and rework was instituted, involving all micrometers in the shop, both company and individually owned. At first, this job was allocated to the tool inspection department whose only method of squaring was by hand lapping.



A close-up showing design of the lead finder. Notice that the indicator is in full view making it easy to read and the large handle, which has about 10 to 1 leverage, insures smooth operation.



Finding the lead on an oversize part so that it may be reground to correct size. Here you see the 60° tip in the valley of the thread. Note the simplicity with which this extremely accurate operation has been accomplished.

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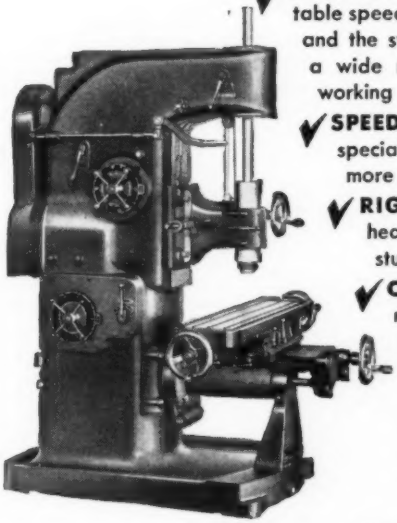

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MANUFACTURERS REPRESENTATIVES WRITE FOR PROPOSITION

This method was unsuccessful from two standpoints: (1) Hand lapping required an average of from 2½ to 3 hours per instrument, entirely too much time. The men of Tool Inspection could not begin to come anywhere near turning out the necessary re-work, considering the thousands of micrometers in the Woodworth plant, so constantly in precise use. (2) The average cost of hand lapping was from $4.50 to $6.00 per instrument, often actually exceeding the original price of the micrometer. Some of the work was sent out to be done. There, too, the cost was inconsistent with economy. Hence, there was an urgent need for a machine to do this precision squaring accurately, speedily and economically.

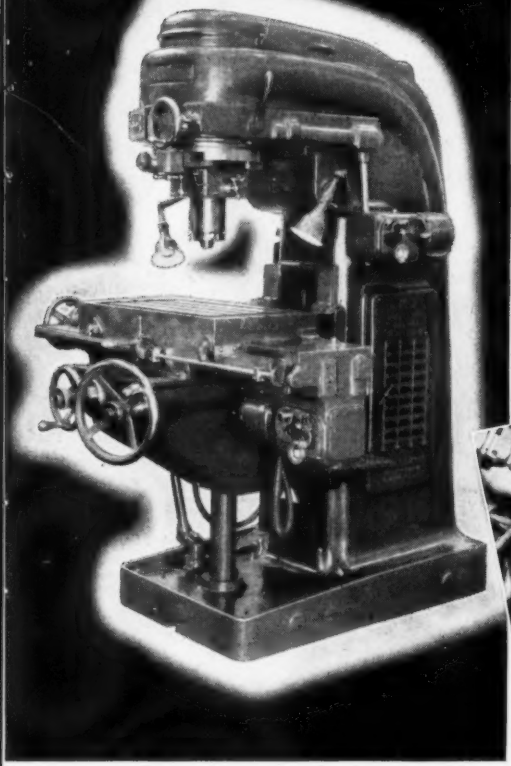
The need was answered by development of the Micrometer Lapping Machine, designed and built by personnel within the company. It does as nearly a perfect job as is possible in lapping micrometer contact surfaces. And it does this in an average of 20 minutes per instrument!

The savings in time and cost are obvious. Even greater savings have been realized thru the use of a second machine, both of which are automatic and easily operated simultaneously by one operator. This work is now carried on in conjunction with other repair work set up in a separate department known as "Precision Instrument Repair."

Assembly of the Micrometer Lapping Machine is mounted on a steel plate table which rides on ball-bearing V-ways. Moving horizontally, this table has sufficient travel speed and adaptability to accommodate from one inch to 12" micrometers, inclusively. The fixtures holding the instruments include a V-block which holds the micrometer at a true 90° angle from face of the lapping wheel. Anvil end of the tool is held in line with the spindle, it being also at a 90° angle from the lapping wheel. This locating is by means of an adjustable block which accommodates the varied size micrometers.

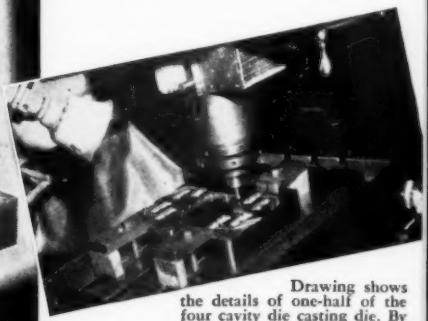
The lapping wheel is mounted on a spindle or shaft which is, in turn, mounted on a bearing assembly operating on centers. It is oscillated by a cam follower. The eccentric action serves to distribute the wear evenly and uni-

"Our Kearney & Trecker Rotary Head Milling Machine increased our die production at least 75 percent"

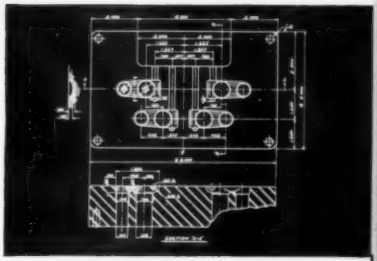


The operation below was performed on a Kearney & Trecker Rotary Head Milling Machine at the McGill Mfg. Co., Valparaiso, Indiana. It shows the machining of a die. Both die halves were properly aligned on the machine table to permit finishing the four cavities complete in one setting. It is typical of the precise work done at this plant.

K. S. Laughery, Superintendent says: "Our Kearney & Trecker Rotary Head Milling Machine has increased our die production at least 75 per cent. It has enabled us to produce better finishes and a superior quality of work. We could not afford to be without this machine."



Drawing shows the details of one-half of the four cavity die casting die. By the rotary head method only one cavity was laid out and then each operation was repeated by "multiple origination."



DIRECT — ACCURATE — FAST — are the three factors that make the Kearney & Trecker Rotary Head Milling Machine so outstanding for toolroom, experimental, and manufacturing work. DIRECT — because it mills intricate shapes in a single setup, transmitting blueprint dimensions direct to the workpiece without the aid of models or templets. ACCURATE — because there is exact control of all mechanical movements. FAST — because initial preparation and multiple setups are eliminated, reducing non-productive time. The accurate performance of the machine also saves operating time.

Write for further detailed information and Bulletin No. 1002C.

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formly over the entire surface of the lapping wheel. This wheel turns at approximately 50 rpm and so evenly is the wear distributed that as many as 150 instruments may be lapped before rework of the wheel is necessary.

The machine has an automatic, horizontal feed which is controlled by a slip clutch and double action spring assembly. No definite feed speed is maintained because the spring has a very light tension and pulls only enough to keep the spindle or anvil of the tool in contact with the lapping wheel.

The lapping wheel itself is made of cast iron. It is impregnated with diamond dust by means of rolling, giving it the essential abrasive characteristics.

The entire assembly seemed to be really quite simple in design and yet so automatic and precise in operation that it may be attended by one who has only slight experience in lapping and instrument repair.

Versatility is another feature of the machine which deserves mention. A small fixture has been developed which, clamping in the V-block, holds the tip gaging surfaces of standard bore gages in position to be lapped. Thru the use of another mountable fixture, tips of depth micrometers may also be lapped in like manner.

Along with the marked savings in time and money by eliminating the necessity of hand lapping, this micrometer lapping machine has contributed further marked savings thru reduction in scrap and salvage parts. It has provided instruments which give true and dependable dimensional readings thruout the varied operations involved in the processes of machining close precision parts.

Let us turn directly to consideration of the second important development which forms the subject of this article —the Thread Lead Finder.

For a considerable time, the repair of threads, particularly oversize pitch diameter and incomplete run-outs, presented a formidable problem in the manufacture of bolts. Losses were excessive and costly due to the inability of locating lead threads on these pieces to be repaired. Parts were located by eye judgment. Since proper repair is

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a matter of locating in tenths of thousandths, it was not surprising that from 75 to 80 per cent of the repairs were located off lead and, consequently, were routed to scrap.

Realizing the need of a device which could quickly and accurately pick up the lead on these threads, all sorts of experiments were advanced and attempted by Woodworth personnel, out of which this fixture to be described was finally evolved.

This Lead Finder is a detachable assembly mounted on the wheel housing of a thread grinder, and consists of a 60° tip, that actuates the .0001" dial indicator, by pivoting on the end of a vertical sliding member controlled by a hand lever.

The assembly is set up in relation to the grinding wheel by first grinding the threads to size on a blank (or part on which no threads have been previously ground), then lowering the tip by means of the hand lever into the valley of the thread. Then tip is adjusted to vertical position by moving the entire assembly on the wheel housing by means of elongated holes in base of fixture. Indicator is next set to zero and machine is ready to start regrinding threads.

After the indicator gage is set, each oversize part to be repaired is subsequently placed between centers of the machine and then the 60° tip is lowered in the valley of the thread and the part adjusted until the indicator shows a zero reading. The lead is thus accurately picked up and established, the thread reground to the current P. D. dimension. A brief movement study of the operation would show these steps:

1—The fixture is attached to the housing and aligned by a set-up man. The time element here is about 30 min.

2—Threads are cut on a green part to provide a master thread for the setting of the gage.

3—The master is then placed in the part fixture, and the lead finder is set in accordance with the pitch diameter.

4—The operator is then ready to run the repairs, and each part is located by the set indicator gage of the lead factor.

5—After being run, each part is checked by the Woodworth Limitrol gage to be sure the part has been repaired properly within the fine limits of the dimension.

As previously mentioned, this lead finder has been the most important factor in the reduction of thread scrap.

Let me draw comparisons on a bolt part, since its production has run in great quantities. The fixture, however, is used effectively on all other threaded parts, irrespective of quantity, as well. In February, 1944, Woodworth engineers told me, out of 439,000 D-23 bolts inspected, approximately 1.6 per cent was scrap for which the thread grinding operations were responsible. Most of this scrap was caused in an unsuccessful effort to repair oversize P.D. and incomplete run-outs. A year later in the same month, out of 116,000 parts inspected, a percentage slightly over one-tenth of one percent was scrap chargeable to the thread grind operation.

The performance, savings, accuracy and dimensional assurance of these two developments have extensive application to peacetime production.

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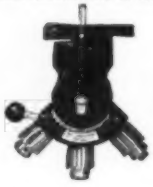

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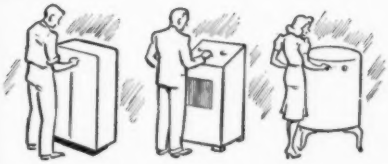
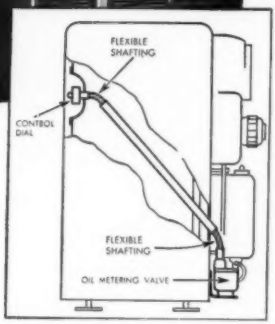


with S.S.WHITE FLEXIBLE SHAFTS



Above is one of the neat, efficient **Quick Heat** oil burning domestic heaters made by the American Stove Company, Lorain Division, Lorain, Ohio. The line sketch shows how S.S. White flexible shafting is used to bring control of the oil metering valve to a convenient location at the front. Photo courtesy of American Stove Company.

Designers of domestic heaters, cabinet radios, television sets, washing machines and other home equipment know the importance of putting control knobs and dials where they are easy to read and to operate.

S. S. White remote control flexible shafting makes it easy to satisfy this requirement. By using this shafting to "couple" the control knobs or dials to the elements they control, you are free to put the knobs or dials *anywhere* you want them. Or, in some cases, the coupling may be done with a combination of rods and short pieces of shafting to make the turns. An example of this latter method is illustrated.

When properly applied, S. S. White remote control flexible shafting gives "finger-tip" control because it is engineered for easy, sensitive operation around turns and in long as well as short lengths. It comes in a large selection of diameters and characteristics to meet a wide range of requirements. The recommendations of S. S. White engineers on specific applications are yours without obligation.

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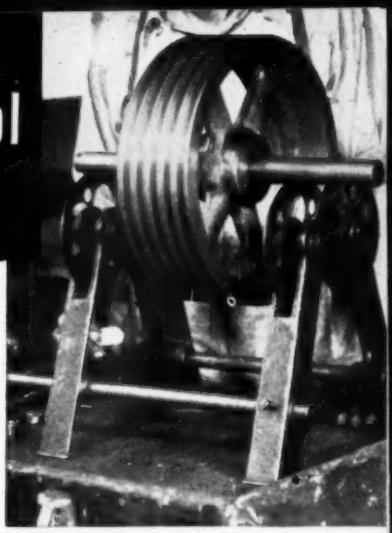

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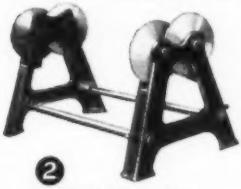

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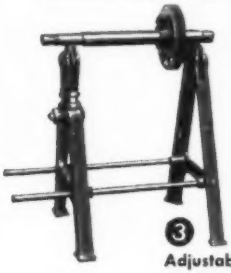

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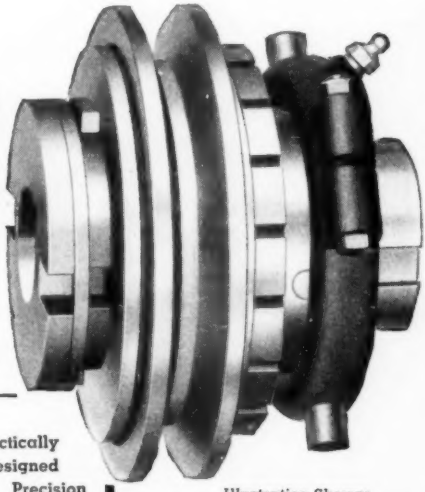

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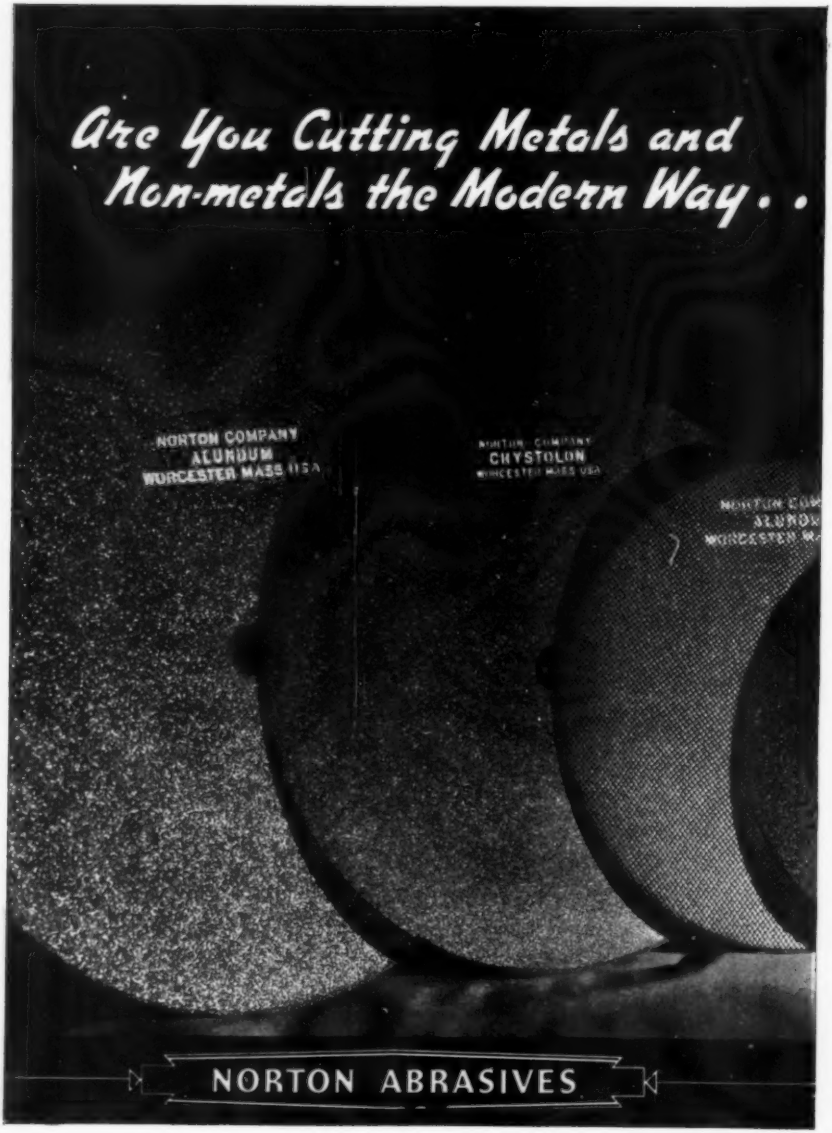
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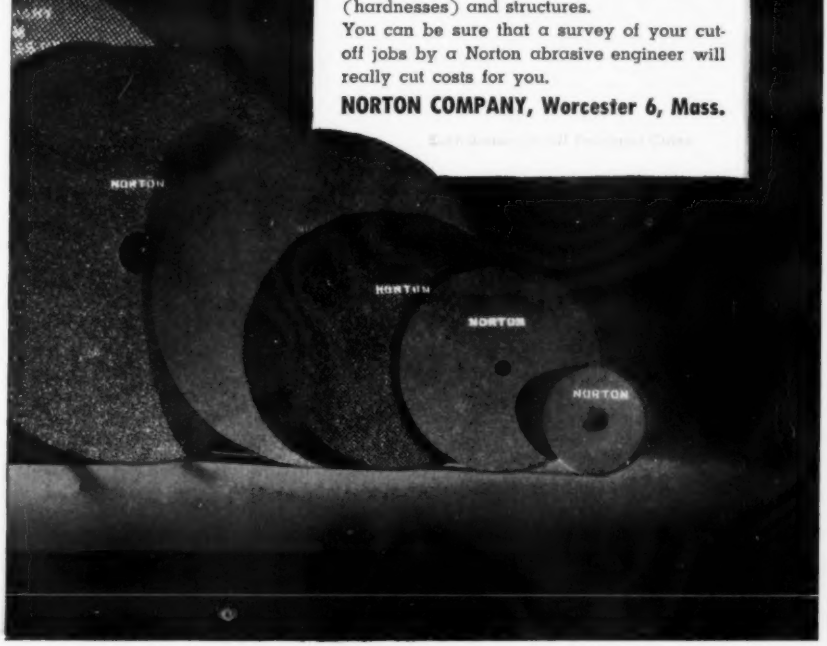


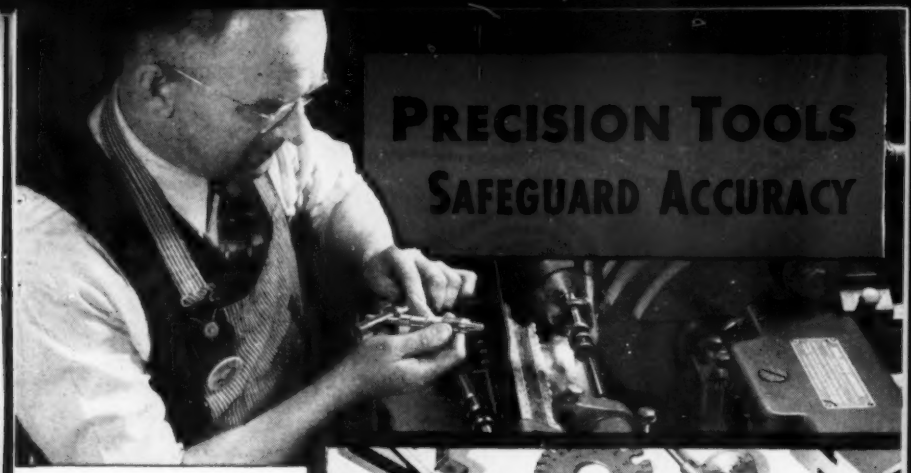
Trends ON THE PRODUCTION FRONT

MACHINING LARGE DIE BLOCKS

THE economical machining of such components as die-blocks has represented one of the major metal removing problems. Milling has always been considered a more rapid method of machining than planing for such applications and is generally used unless the surface pressures resulting from milling are objectionable or the surfaces to be machined are too large for economical and feasible cutter application. Planing is employed when extreme accuracies are called for by the specifications and the nature of the job prohibits the use of a multi-tooth cutter. This is not frequently the case; at times jigs and fixtures with tolerances in the neighborhood of several tenths and with thin cross sections may require planing with its lower pressure. The distortion resulting from a single point tool operation under these conditions will be less objectionable than that resulting from multi-toothed cutters.

The machining of large surfaces, such as die-blocks, presents an almost impossible operation unless performed with a single point tool as on a planer. At least this has been true until very recently. Now such surfaces can be profile milled either on a large rugged but accurate horizontal bar or a large bed or planer type milling machine.

A 6½ ton semi-steel cast iron casting being milled on a No. 5 Sellers Bar machine. Surface foot rate, 210 feet per minute; feed 20" per minute; depth of cut 5/16"; chip load .025"; h.p. 25; micro-inch surface 30 to 40.



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Excellent surface condition of semi-steel cast iron casting milled 5/16" deep at 20" (.025" C.L.) indicated by 30 micro-inch reading. Possibility of matching 5" wide cuts is also apparent from this illustration.

The former application will be referred to in this discussion. A surface measuring 60"x30" was milled successfully by this method on a Sellers No. 5 Bar using an 8" Face Kennamill. In the hands of a skilled operator, this piece of equipment milled a surface on a semi-steel casting, corresponding approximately with the dimensions already mentioned, with all of the surfaces (approximately 5" wide for each cut) so neatly and accurately matched that it was scarcely possible to detect any differences with a Profilometer. In addition, the surface indication by Profilometer was 40 micro-inches. This, obviously, is exceptionally good for a porous material such as a semi-steel casting. This result was obtained by the use of a new grinding technique and a radically new design of facemill. But the matching of the surfaces is the result of a rugged yet accurately constructed horizontal bar such as the Sellers No. 5.

This operation was performed at a feed rate of 20" per minute which with an 8" cutter (8 tooth) and 210 surface feet per minute resulted in a chip load of .025". A cut 5/16" deep and 5" wide at 20" a minute represents approximately 31 cubic inches of metal removed per minute. The horsepower for this cut is 20 and therefore the F factor is .6.

Thus with a horsepower expenditure of 20, within the reasonable and normal operating range of all present equip-

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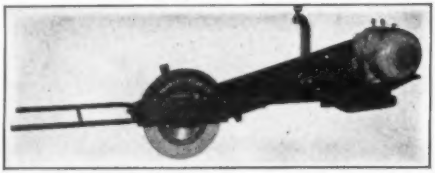

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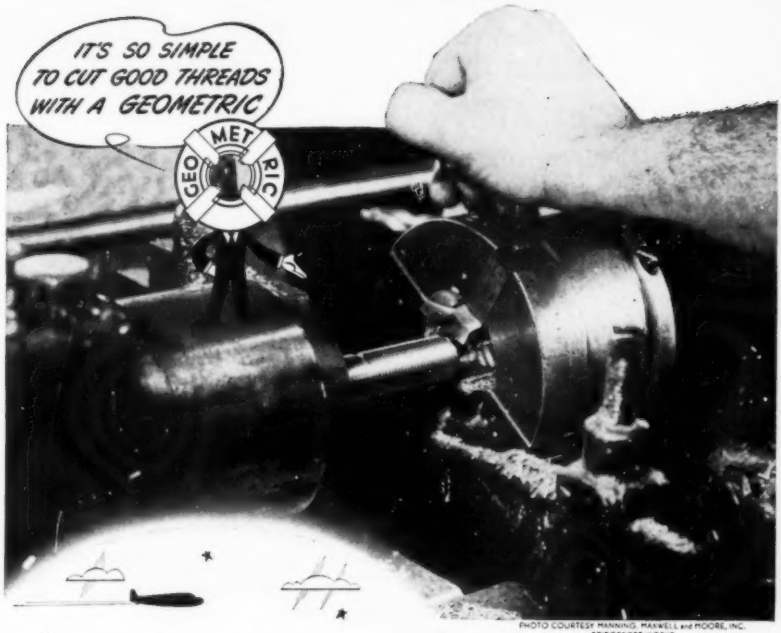

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On the screw machines of today are being cut the threads of tomorrow — threads that will be used in the mechanized products of a new age. And whatever the threading job, you'll find Geometric Die Heads giving precise, rapid performance. The sturdy 1¼" Style "D", Self Opening Geometric Die Head shown in the above photograph (cutting a ⅞"-14 NF thread on a Compression Screw for a Steam Valve) is typical of thousands in use all over the world. This particular Die Head cuts threads from ½" to 1¼" while the entire Style "D" line cuts threads from ⅛" up to 3½".

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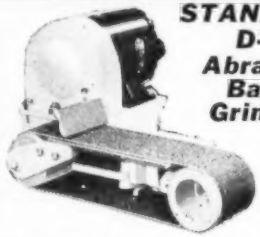
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OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY
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ment, large surfaces can be milled satisfactorily. To machine this same area with a cutter 40" in diameter operating at satisfactory cutter life, and therefore a chip load of .010" minimum would demand at least 75 hp. Using an 8" diameter cutter and taking six passes, profile fashion, requires less than 25 minutes at 20" feed rate. This permits taking six cuts and overlapping each 5" wide path so as to match the surfaces properly.

The same operation performed on a planer would require at least 2½ hours for roughing alone. Another hour would be required for finishing and the surface condition would then be far from the equivalent obtained by the milling operation described.

The surfacing of large die-blocks has necessarily been performed up to the present on large planers. Milling of these components has been impossible because of the difficulty of matching surfaces but particularly because of the large and abnormal amounts of power required to mill such surfaces in one pass. A machine tool of 100 or more hp would be required for this operation.

Using a large horizontal bar and the Kennamilling technique incorporating a new method of grinding and blade setting (which leaves the cutter body on the spindle or arbor while the used blades are replaced with a freshly ground set) this operation can now be performed, not only satisfactorily as regards surface finish but also as regards time saving and above all a normal consumption of power.

By H. A. Frommelt

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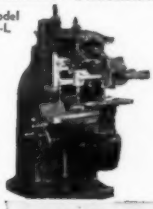

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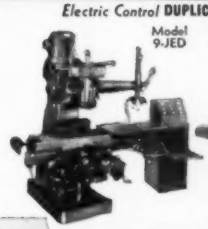
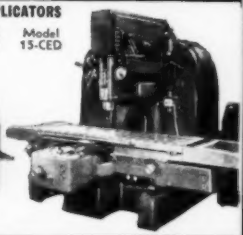


Model 15-CED



Super Speed **MILLING MACHINES**
Vertical and Universal Head

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Model 8½-D

Model 9-J

The *Right* MACHINE for MOST JOBS *in Tracer-Controlled* MILLING

- **STANDARD LINE**—10 types of versatile machines, 20 sizes—580 accessories.
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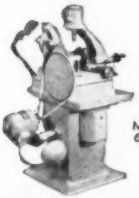
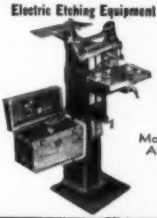


Model 687-1

Electric Etching Equipment



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Automatic Screw Machines
(SWISS TYPE)

Model 16-B

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Condensed Catalog of entire line of Gorton machines and accessories — or other Literature sent on Letterhead request, except 153-page Handbook (No.10, at left)—sold at $2.50 per copy.

Circle numerals for bulletins wanted... attach to your letter.

1 2 3 4 5 6 7 8 9 10

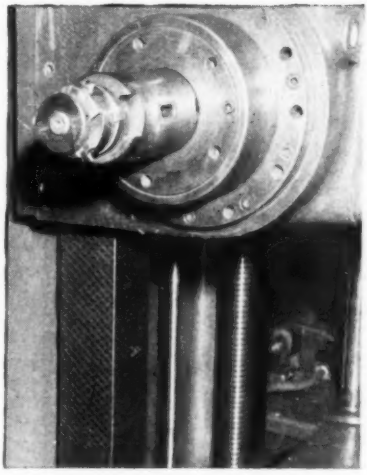
GEORGE **GORTON** MACHINE CO.

1401 RACINE STREET, RACINE, WISCONSIN, U.S.A.

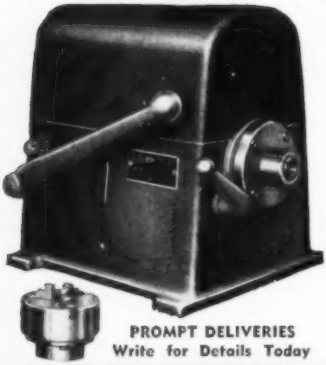
BORING WITH CARBIDE TOOLS

THE more economical carbide boring of holes with greater precision than heretofore possible, is a definite industrial trend that results from a very interesting development now available as an accessory for application to horizontal boring, drilling and milling machines. Precision boring of holes in steel and cast iron and alloys including the non-ferrous materials is now accomplished in considerably less time than formerly. A Kaukauna quick change boring head makes this possible.

Fig. 1 presents this accessory as attached to a 4" Giddings & Lewis horizontal boring, drilling and milling machine. Essentially it consists of a body composed of a tapered spindle and integral plate on which is located one key. The eccentric head has milled into it three keyways corresponding to the rough boring position of carbide tool No. 1, semi-finish boring position of tool No. 2 and, finally, the finish boring position of tool No. 3. This eccentric



The COLBORNE SPEED LATHES



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A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality work with the COLBORNE features of spindle bearings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-4800 RPM using ¾ H.P. motor and cone pulleys. Collets and chuck may be used.

For more production per day choose COLBORNE.

COLBORNE MFG. COMPANY
BUILDERS SINCE 1879
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here's power for industry

THE NEW DELCO MOTOR

This is not merely an "improved" motor; it is new—designed and built to meet specifications for "the perfect motor" worked out by men who live with machine tools . . . who use and service motors every day in big production plants.

It has *all* the qualities and features that production men specified as most important for solid, on-the-job performance . . . including doubly protected coils and windings—*with coils individually taped;* better cooling; ruggedness and simplicity in construction. It provides much easier maintenance, easy attachment on tools, four-position operation, and better applied power.

Complete information available on request.

Check these
NEW DELCO MOTOR FEATURES

- Totally enclosed; fan-cooled.
- Individually taped coils.
- Thoroughly insulated windings.
- Unit-cast ball-bearing rotor, dynamically balanced; parts interchangeable end to end.
- Double-shell frame with new simplified cooling system.
- Extra-large conduit box, usable in four 90° positions.
- Extended, accessible mountings, cast as a unit with main frame.
- Sizes to fit standard NEMA machine tool mountings.

DELCO MOTORS

DELCO PRODUCTS DAYTON, OHIO

DIVISION OF GENERAL MOTORS CORPORATION

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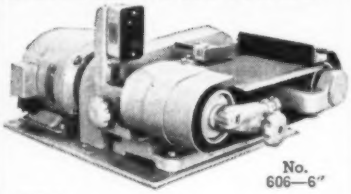
BENCH SURFACER



No. 606—6″

This
BELT SURFACER

is indispensable for cleaning and finishing castings, dies, stampings and any work that can be ground. Sturdily constructed, it is accurately balanced and equipped with ball bearings throughout adapting it for the hardest kind of constant use.

Let us send bulletin giving full details.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

LET
Timesaver
LAPPING COMPOUND

GIVE greater accuracy in fitting hard or soft metal bearings, gears, valves, slides, etc. In successful use since 1919.

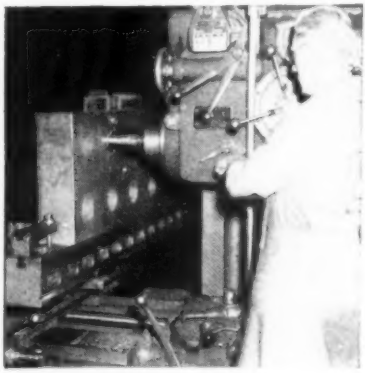
TIMESAVER positively does not imbed. Compound comes in powdered form and is mixed with oil as used. Applied to parts to be fitted, Timesaver first acts as an abrasive, then its particles progressively diminish to a polish, finally to an inert material with no cutting action.

Samples and information on request.

TIMESAVER PRODUCTS CO.
31 SO. DESPLAINES ST., CHICAGO 6, ILL.

head is locked in position by means of a nut clearly visible in the illustration. Tool No. 2 is a standard left-hand carbide boring tool so that the semi-finish cut can be taken on the return or inward movement of the bar; both the roughing and finishing operations are performed with right-hand standard tools and take their respective cuts while the bar is moving forward or away from the column.

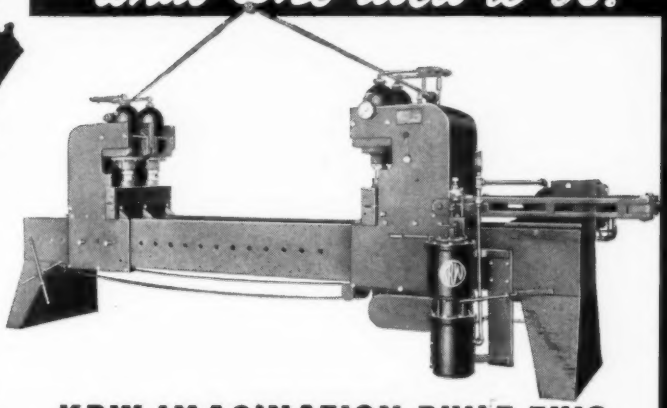
Thus, the operator can change from position No. 1 to position No. 2 in a few seconds the moment that the boring head has passed thru the hole and completed its first or roughing pass. This is immediately evident from illustration, Fig. 2. The operator merely loosens the lock nut, and shifts the eccentric head to position No. 2. In this manner Tool No. 2 is brought into position for the semi-finishing operation. The same action or cycle is repeated to change from this second to the third or finish boring position.

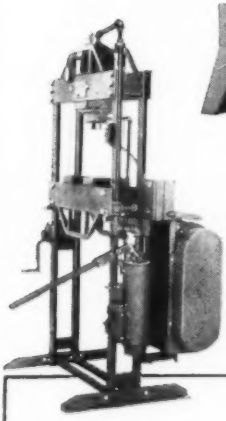


In Fig. 2, a steel plate is being precision bored as a jig component on a G & L 4″ bar. The roughing operation on this 4″ diameter hole is being performed at 319 rpm or 344 sfm, and the depth of this cut is 3/16″ on the radius, or 3/8″ on the diameter. The feed is .015″ per revolution or 4-3/4″ per minute.

The semi-finish cut is taken, as previously indicated, while the bar is re-

The "Old Grey Mare" ain't what She used to be!





KRW IMAGINATION BUILT THIS 24" x 96" METAL STRETCHER AND DID IT IN A MATTER OF WEEKS

... Not Months

★ It is hard to believe that the Five and a half ton metal stretcher shown here is basically only a hydraulic arbor press despite its unfamiliar appearance. In this unit, hydraulic ram heads have become hydraulic grippers; others mounted between the bed members, move the head horizontally to do the stretching.

This special press answered a manufacturer's prayer —cracked a tough production bottleneck. Yet the press was designed, engineered and built in record-breaking time. A similar job can be done for other manufacturers with other problems just as complicated. To get the "inside story", mail the coupon below for your copy of the new 32-page illustrated KRW catalog —it's full of valuable production suggestions.

More Imagination!
THE KRW *Motor Driven* HYDRAULIC ARBOR PRESS

★ Built in several styles to suit individual needs. Utilizes a magnetic push button starter plus a hand-operated valve control to enable the operator to raise, lower or stop the ram at any desired point and return it to top position. This KRW motor-driven pump unit can be applied to any KRW hand-operated hydraulic press so that the hand pump can be used to obtain pressures beyond the maximum of the motor unit. This offers a low-cost means of motorizing existing KRW presses.

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Gentlemen:
Please send me a copy of your 32-page Hydraulic Press Catalog.

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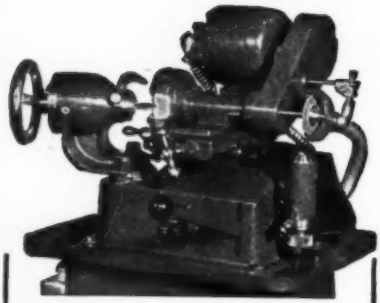

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CHAMFER • FLUTES • SPIRAL POINT

Fast—easy to operate. Complete—no parts to change. Capacities—No. 2 to 1½" hand taps—with interchangeable heads.

HEADS ONLY AVAILABLE FOR USE ON UNIVERSAL TOOL & CUTTER GRINDERS.

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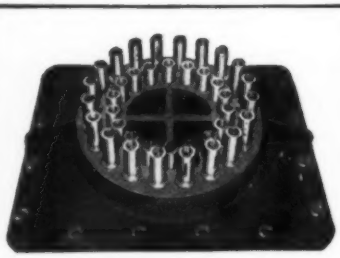

Pictured: a 38-Spindle Heavy-Duty Drill Head.

DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT

We invite your inquiry.

MICHIGAN DRILL HEAD CO.

971 E. 8 MILE ROAD HAZEL PARK, MICH.

turning or moving toward the column. The rpm of this cut is 386 or 417 sfm. The feed is again .015 per revolution or 5.8" per minute. The change from position 1 to position 2 was effected in this instance in less than 10 seconds. The standard left-hand carbide boring tool takes this semi-finish cut on the return movement of the bar and hence no time is lost in bringing the bar or head to a new position. The depth of cut is now .050" on the radius.

The third or finish cut is taken at 470 rpm or approximately 507 sfm. The feed per revolution is again .015" and hence the rate per minute is 8" approximately. This last cut is taken while the bar is moving outward or away from the column and hence a right-hand boring tool is uscd.

The economy of time in the application of this Kwik-Size boring tool to operations such as described is impressive. And with carbide the finish is excellent.

MATERIAL HANDLING

WITH material and labor costs rising steadily, American manufacturers' greatest hope for keeping on a sound competitive basis lies in their ability to reduce overhead thru efficient plant layout and material handling, members of the American Management Ass'n were told recently.

"In a normal pre-war year, our industries paid out more than five billion dollars just for handling material from the receiving to shipping stage," declared R. W. Mallick, head of the Plant Layout and Materials Handling Section of Westinghouse Electric Corp. "With proper planning by competent engineers, handling costs can be greatly reduced."

"Despite our famed mass production methods of processing and assembling, we have not even scratched the surface of the potentialities offered by sound industrial planning."

Mr. Mallick pointed out many manufacturers fail to recognize that material handling requires more human effort than processing or assembling and therefore accounts for a greater percentage of the true production costs.

"Studies reveal that within factories, a unit of material averages from 20 to 150 handlings, dependent on the product and the industry," he continued. "Taking the minimum figure, for every 1,000

Case history No. 204—*The job was a tough one on files which were used to remove sharp edges from a bomber gun-port ring as it was spun in a bench lathe. Ordinary files quickly showed extreme wear.*

On one of his calls, a Nicholson service engineer quickly solved the problem, both as to finishing results and from the standpoint of file-replacement costs.

A 10" Nicholson file for Stainless Steel, in the Bastard cut, was tested on the job. It cut extremely well, and showed only a fraction of the wear of the files previously used.*

NICHOLSON service engineers constantly find instances where using ***The right file for the job*** clearly shows better work, faster production, or lower file costs. They also find instances where the ***wrong*** file is incurring excessive costs. Nicholson has always gone beyond just making good files. Here the study of industry's filing problems is a never-ending one.

"*FILE FILOSOPHY*," the 48-page illustrated Nicholson book on kinds, use and care of files, is yours for the asking.

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(In Canada, Port Hope, Ont.)

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FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

*MILL BASTARD for STAINLESS STEEL—specially designed to resist abrasive action of hard chromium and nickel content of stainless steel. Be sure orders specify "for Stainless Steel."

pounds of material received at a plant, you pay for handling 20,000 pounds thru your plant. More efficient handling methods will reduce costs, reduce accidents and allow more production with better quality."

While proper planning for most efficient material handling can be worked out for existing factories, it is doubly important that this type of planning be "built into" new plants in this post-war era, Mr. Mallick said.

"Architects, structural engineers and builders are responsible only for the soundness and safety of new structures," he asserted. "But they are not responsible for the utilitarian value of the plants they build as measured against the manufacturing requirements of a product.

"Efficient layout engineering done before the architect, the engineer and the builder go to work is the key to successful operations in which material handling costs are kept at a minimum."

Mr. Mallick declared that one of the most pressing problems of industry today beyond immediate physical reconversion to peacetime production, is production and sale at a profit.

"Despite all the pent-up demands, industry everywhere is faced with the same pre-war problem of producing to the highest quality and competitive price," he said. "It is the American way and it will hardly change. And in this competitive battle, only those who accomplish results thru the most modern and efficient methods can hope to gain the profits they deserve."

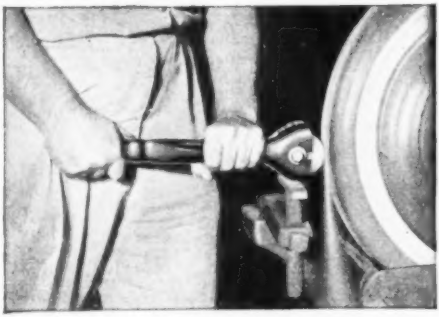
CONSTANT INSPECTIONS

Frequent inspections all along the production line enabled Westinghouse Electric Corp., to increase the output of certain war supplies 30 per cent or more and specially developed wartime quality control methods will help make more and better peacetime goods, members of the Rochester chapters of the Society of Tool Engineers and the American Society for Metals were told recently.

"Quantity production of goods," said Joseph Manuele, director of Quality Control for Westinghouse, "means little if a large percentage of parts turned out must be scrapped or reworked because of poor quality.

"Inspection during production, instead of afterward, assures uniform quality with a low percentage of spoiled or unsatisfactory work."

DESMOND GRINDING WHEEL DRESSERS



Correct method of using Huntington Dresser.

You can increase your grinding production by dressing your wheels regularly with Desmond Dressers.

We manufacture the only complete line of dressers and will be glad to send any of them to you for trial or advise the type and size you should use.

Write today for a copy of our catalog "H" and name of your nearest dealer.

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For FORMING
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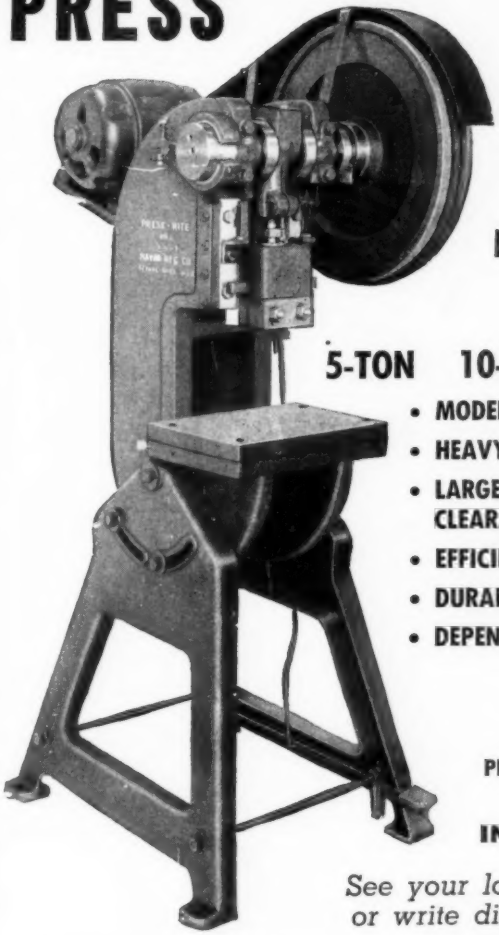

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Press Right with a PRESS-RITE PRESS

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INVESTIGATE

See your local dealer or write direct to us.

SALES SERVICE MACHINE TOOL COMPANY

2426 University Avenue **St. Paul 4, Minn.**

On one particular item required by the Armed Forces, the number of inspectors was reduced from 13 to seven, scrap was reduced from six per cent to one per cent and gage life increased from four hours to two weeks. The net savings on this one item were over $185 per day, with production increased about 10 per cent, the speaker said.

Two techniques are used for controlling the quality of products during manufacturing. The first is based on the frequency distribution curve and the laws of probability. While the principles underlying this method are complex and are based on pure mathematics, they are well understood.

"By this method," Mr. Manuele pointed out, "it is possible actually to predict when defective parts will be produced so that preventive measures can be initiated to forestall or prevent such defective parts being produced."

The second method is based on "first piece and patrol inspection", or floor inspection. This requires that the inspector observe the operator while the job is being done, and he judges the quality of the work before it is completed, rather than waiting until it is finished to inspect it and then find it does not meet the specifications.

"This brings the inspector intimately closer to the point where the work is being done," the speaker said, "thus helping him do a better inspection job, prevent the production of defective units, and increase production generally."

These new methods, Mr. Manuele asserted, supersede the old methods when the inspector was satisfied to wait until a quantity of parts or items were made and submitted for inspection. This method did not improve quality of the product, nor did it prevent production of defective units.

The new methods for controlling quality require very sensitive measuring instruments, he said, adding:

"Gages which can measure parts to a hundredth of a thousandth of an inch are common in Westinghouse shops. These methods also require high caliber inspectors with special training, and Westinghouse has run courses for its inspectors for years.

MACHINE TOOL SALES

The up-turn in machine tool sales, to permit full postwar production, will not take place at least until next spring.

Conditions holding back this essential step in industry's reconversion to peacetime output were disclosed in a survey

SPRING PRESSES

Send for circular

Power and Foot Operated...

TAYLOR & FENN Spring Presses are used for Riveting, Staking, Stamping and similar operations on small, light parts. They are constructed to compensate for variation in thickness of the work and to deliver repeatedly a UNIFORM BLOW.

M-110 (illustrated) powered by a small reducer with a one-sixth H. P. motor, is designed to eliminate the fatigue factor inherent in foot operated Presses. A similar Press, M-120, of the same size and capacity is equipped to operate by compressed air.

OTHER MACHINES MANUFACTURED:

Vertical Millers
Duplex Spline Millers
Medium Duty and High Speed Sensitive Drilling Machines

THE TAYLOR & FENN CO.

HARTFORD, CONN. U. S. A.

This holder is especially designed and adapted for use with models 4D and 4DE machines only. There are many other Potter & Johnston tools that would be helpful in cutting production costs to meet post-war competition.

STANDARD ADJUSTABLE TURNING TOOL HOLDER

This adjustable tool holder will carry two Stems, either for turning or boring cuts, and in addition, a boring bar or drill may be carried in the center hole. The cutters are quickly set to the required diameters by moving the adjustable block up or down. The side scale and the micrometer dial under the ball crank contribute to quick and accurate settings which may be changed easily with the job. Two locking screws on either side of the block fix it solidly in the location desired. The adjustment range of the Stem holes is from 4 to 10" from the rotation center.

If you use Potter & Johnston machines in your plant, it will pay you to let us send you a copy of this catalog on modern tooling. It illustrates and describes a broad range of up-to-the-minute production tools.

The POTTER & JOHNSTON MACHINE CO. PAWTUCKET, RHODE ISLAND

conducted among 60 field representatives gathered recently from all sections of the U.S. for the Annual Sales Meeting of the Warner & Swasey Co.

With surprisingly little variation, the sale of new machine tools over the entire country during the first quarter of 1946 is expected to remain at about the same level as it has during the past three months.

Increased purchases in Philadelphia will be completely offset by reduced orders in the Pittsburgh and Cleveland area.

There is, however, a rising trend—as definite in West Coast industry and thruout the South as it is from Detroit eastward—toward replacement of present obsolete equipment with new types of machine tools now being introduced.

Strikes and demands for higher wages, coupled with the ceiling on prices, are holding back the signing of actual orders for such new equipment by West Coast, New England and East Coast manufacturers, pending clarification of the Labor-OPA situation.

This stalemate is particularly distinct in Detroit, whereas manufacturers in Buffalo, Toronto, Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago and Milwaukee are in a state of indecision on these points.

Those in the southern industrial areas as yet express little fear of strikes. Pressure there for higher wages is acting as a deterrent, particularly in larger plants, but price ceilings are less of a problem.

Acording to this survey, acquisition of government surplus machine tools shows up as a stop-gap measure in a degree corresponding to reactions on the Labor-OPA situation.

About 60 to 70 per cent of machine tools purchased in industries of the East and West Coasts, and around Detroit, fall in this category.

The South is splitting its orders between surplus equipment and tools of new design, while midwestern manufacturers and those in the "industrial triangle" range downward to a narrow margin of acceptance for government surplus.

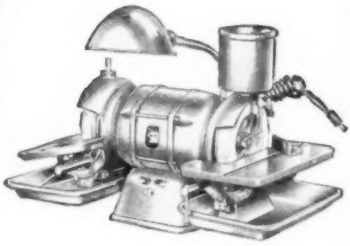
Thruout the country, the low price and early delivery of machines from government inventories are major factors of consideration, altho equipment thus far acquired from this source has proved satisfactory as a means of speeding reconversion beyond question only in a few stabilized industries where the reconversion problem is minor.

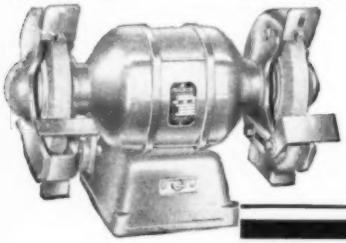
BALDOR
BALL BEARING GRINDERS

— built for long, heavy-duty service

AT RIGHT: Special Carbide Tool Grinder for accurately and quickly sharpening carbide tools; sturdy ½ hp., ball-bearing, reversible motor, 6" silicon carbide wheels, adjustable tool-rest tables. Complete as shown.....$110.00

BELOW: New, improved BALDOR Grinder No. 8100; ½ h.p. ball-bearing, Capacitor-type motor; 1700 r.p.m., 1-Ph., 60-cy. 8" Aloxite Brand wheels.....$54.00





Ask for Bulletins 321 & 322

BALDOR ELECTRIC COMPANY
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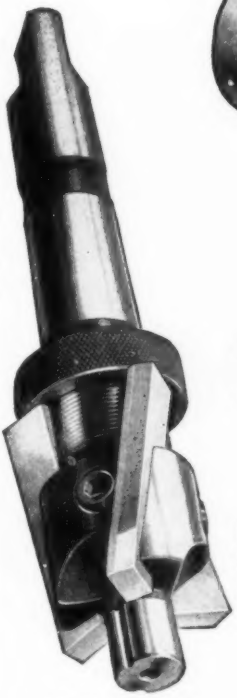
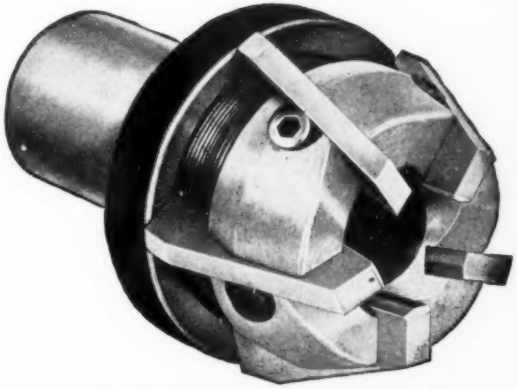
GENESEE ADJUSTABLE HOLLOW MILLS



(Standard Style H)
Facing & Counterboring
Tool



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with GENESEE inserted blade—

ADJUSTABLE HOLLOW MILLS
FACING & COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS

Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

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MANUFACTURING CO., Inc.
ROCHESTER 4, N. Y.

ELECTRONIC MACHINE TOOL CONTROL

AN "electronic finger," which automatically controls the operation of a machine tool, has been developed by General Electric engineers.

From shaping graceful candlesticks to highly-essential superchargers for aircraft engines—it's all the same to a machine tool controlled by this new automatic contouring control system.

In fact, almost anything that can be cut with a motor driven tool from a pattern or template can be produced accurately and completely automatically with a machine equipped with this versatile device which literally has a "sense of touch."

The vital part of the "anatomy" of this human-like control device is an "electronic finger" which feels its way around the angles and curves of a pattern to control operation of the cutting tool.

This feeler or tracing stylus comprises, in electrical terms, two magnetic bridges, each consisting of two identical magnetic circuits, one pair mounted on an axis at right angles to the other pair. The four magnetic poles are assembled on a diaphragm which is fastened to the stylus,

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3. Plunger Rod Base now made of Stainless Steel
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8. Dial of Gauge now has Zerominder Scale for Speed
9. Finish now Greatly Improved over War Times

Most used testers of our make lack all of these 9 things and all but those made within the past twelve months lack many of them.

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a fingerlike projection which touches the pattern or template.

In operation, the stylus of the tracing head is moved against the side of the contour on the pattern to be reproduced. The very slight pressure of the feeler against the template causes a deflection of the diaphragm which in turn creates a change in voltage in the coils of the tracing head. This voltage is then carried to the "brain" of the entire device, where signals from the bridge circuits are amplified many times and "mixed" into what is called a vector signal—a signal which is related to the direction of the pressure on the stylus. This signal causes the stylus to be driven against the template and as the deflection of the stylus increases, the vector signal is shifted by a "bender" circuit to cause the stylus to move along the surface of the template with a uniform deflection.

The signal from the "bender" circuit is sent into a translator circuit which produces two separate d-c voltages. Each voltage determines the speed of one of the two feed motors. These voltages are so co-ordinated that the resultant speed of the stylus around the template is constant, regardless of the direction. When a change in contour is encountered, one motor will automatically slow down or speed up just the proper amount to reproduce on the piece of work in the machine the same contour encountered by the stylus on the pattern. If a 90° angle is encountered, the direction of pressure on the stylus and the direction of motion is changed by 90° almost instantaneously. Either an inside or an outside angle can be cut in this manner.

Because the "bender" circuit of the device provides complete control over movement of the tracing head, it is impossible for the stylus to stray away from the template. The instant such a tendency occurs, the vector signal automatically forces the head against the pattern, insuring not only a constant degree of accuracy in pattern reproduction, but a continuous cutting operation on the most complicated of parts.

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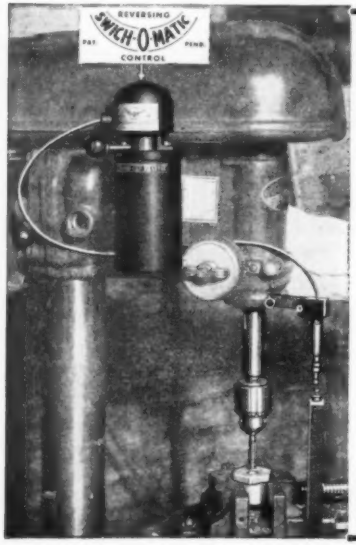

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Work to be lapped is placed between two different size precision ground cast iron rollers revolving in the same direction. A notched fibre stick is held against the plug or rod and moved evenly over the entire surface. Small portions of the plug may be lapped by holding the notched stick in one place for a longer period. Tapered plugs or those with shoulders are lapped on the SPITFIRE almost as easily as straight plugs. Work up to 6" in diameter may be accommodated. SPITFIRE ROLLER LAPPING MACHINES have been ordered and re-ordered by leading tool and die companies.

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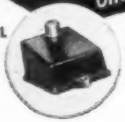

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Provisions are also made on the master control panel for remote nonautomatic operation of the contour equipment. By merely pushing a button, an operator may release the automatic control and take over the operation of the machine himself. With this method, the speed, direction, and control of the motors is handled by the operator thru a system of push buttons and dial controls on the master panel. There is no danger of overcutting the pattern, even manually, for when the stylus touches the pattern, the automatic control takes over and follows the template until the operator again takes control. This manual operation is particularly advantageous in following an outline pattern instead of a cutout template. The operator can then direct the tracing stylus over the drawn diagram in pencil fashion, and the motors will take care of moving the machine to follow the stylus.

Extremely simple to operate, G.E.'s new control can be applied to many different types of metal cutting tools and is capable of a variety of intricate cutting operations, which, if done by complete manual operation, would involve many separate directional cuts and endless gage checks.

In tests made during the control's development, chess men were turned from brass using automatic contouring control. Five intricately contoured chess pawns were turned from the same template, each pawn with a ball at the top. Tho the lathe turning of a perfect ball, alone, is considered by experienced lathe operators to be an extremely difficult operation, gage checks on the finished pawns showed less than a thousandth of an inch deviation from measurements among all five.

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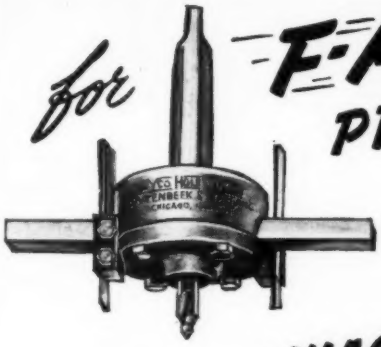

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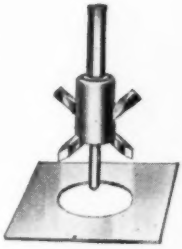

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TAP ADAPTERS Change taps instantly in the single spindle with these hardened and precision ground adapters.

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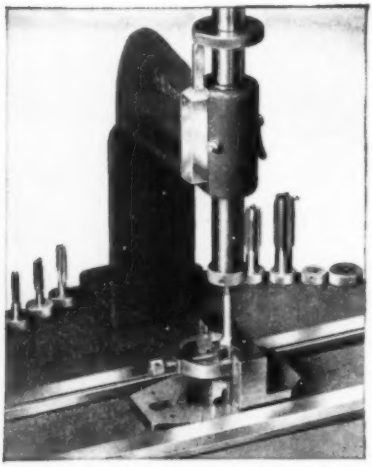
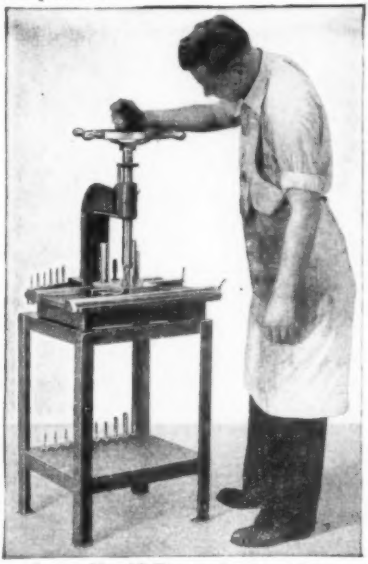


Close-up of single spindle and depth gauge. A piece of work, being threaded by a button die on the spindle, is held by a Lassy No. 15 Work Holder which is held in position by the stepped holding bars.



Lassy No. 12 Tapper in operation.

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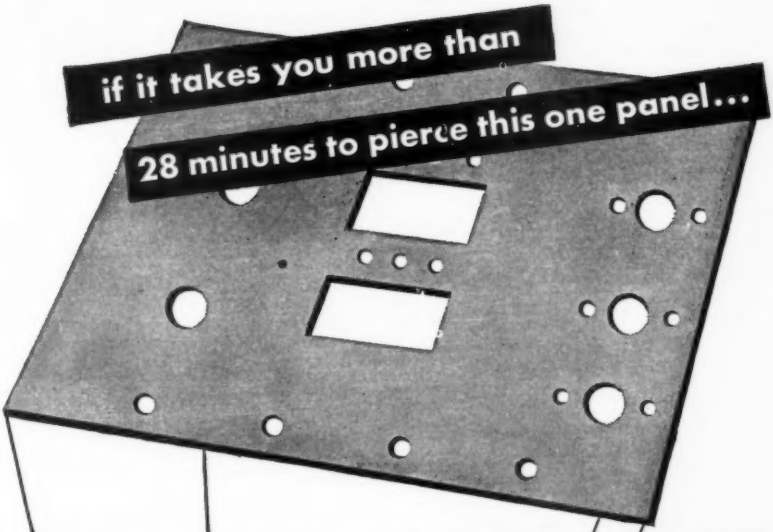

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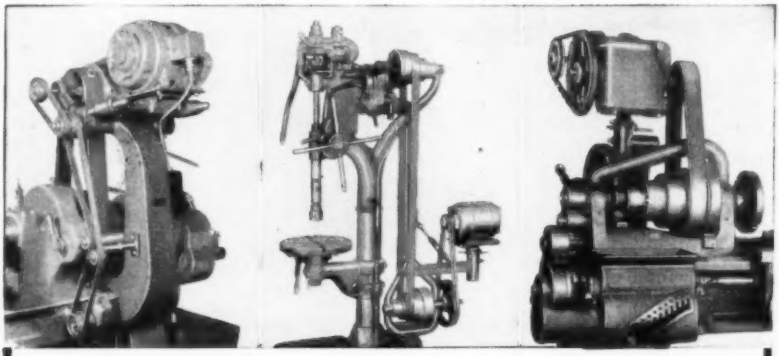

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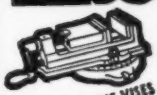

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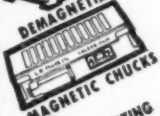
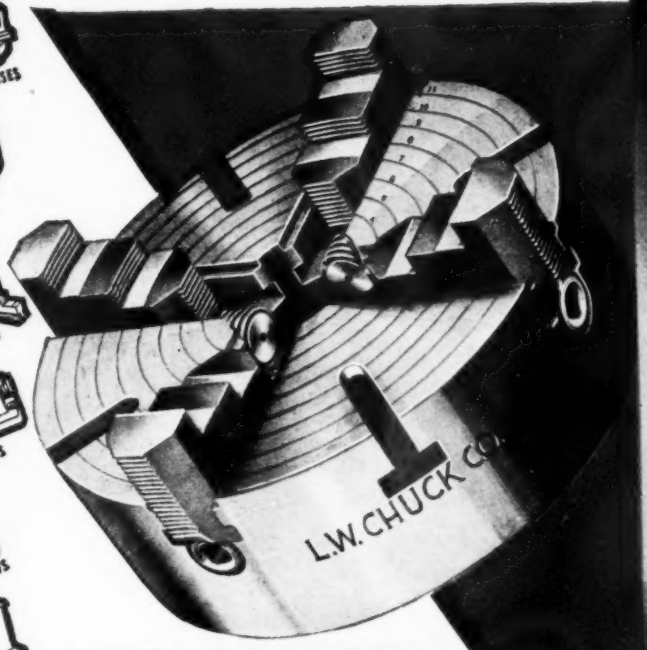
DEMAGNETIZERS



MAGNETIC CHUCKS

DEMAGNETIZING SWITCHES

RECTIFIERS



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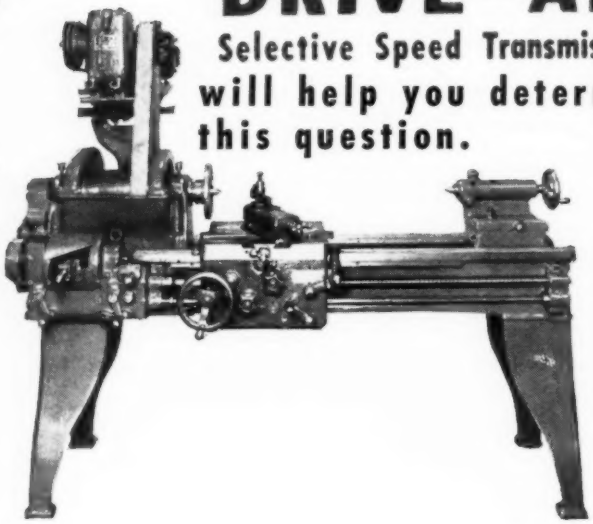

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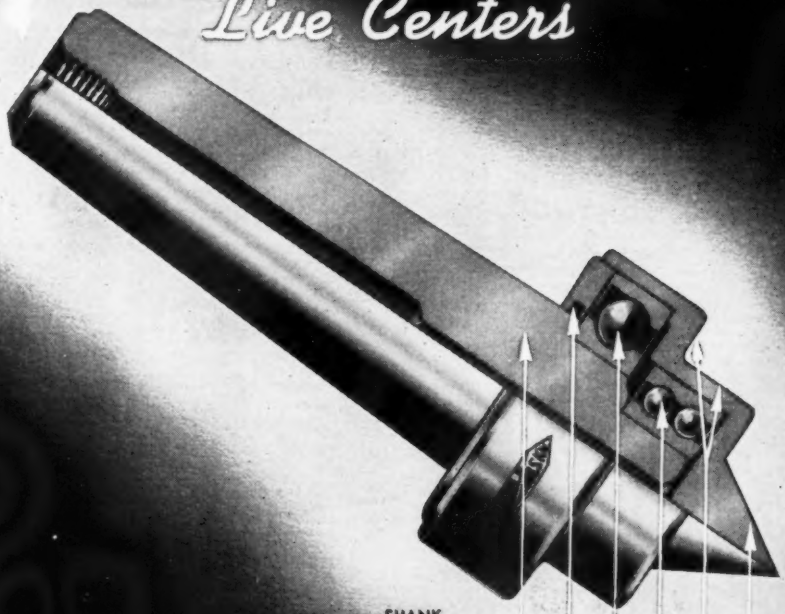

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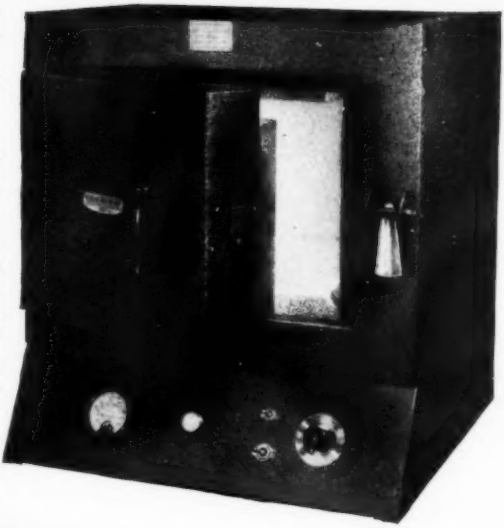

Model 7002 . . . 220 volt operation. Interior, 12"x12"x10". Exterior, 22"x22"x24". Shipping weight, 350 lbs. Only $222.50 FOB Philadelphia.

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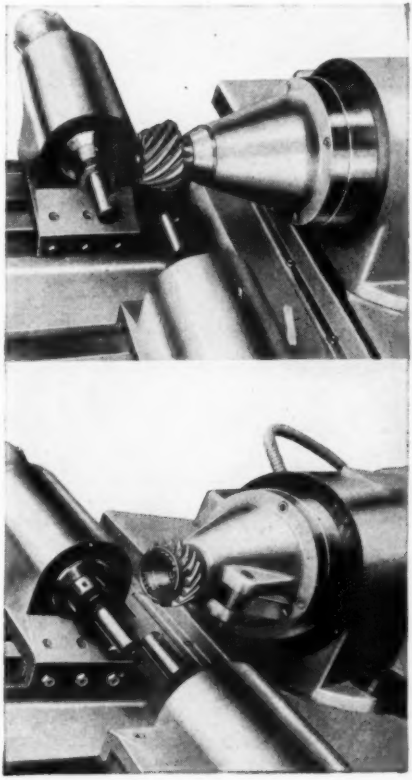
Aspects of Gear Finishing

By JOHN E. HYLER

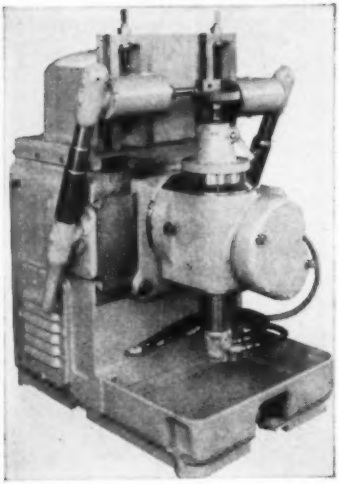
ONE man may think of gear finishing chiefly as a refinement of tooth working surfaces, thru lapping, etc., while another may think more particularly of corrective measures for errors in tooth form, as in shaving and/or grinding processes. Still another would think of finishing operations as burring and chamfering gear teeth, or possibly gear tooth thinning and other operations constituting the finishing touches on gears of some very special types. It is probably correct to combine all such operations under the general title of gear finishing.

In some instances, plants hob gears with enough stock left standing to take care of both hobbing errors and heat treating distortion. After hobbing, the gears are put thru a shaving operation, on some of the excellent gear shavers available, taking off enough stock to overcome hobbing errors, if any, and later the gears are hardened. After hardening, they are ground, and finally lapped. Grinding takes out any appreciable errors resulting from distortion during the heat treating process, and the final lapping refines the surfaces of the teeth.

In some instances, gear grinding is done without sparking the wheel out. Sparking out takes considerably more grinding time on gears, and any error left by not doing so is sufficiently small, in most cases, that the final lapping will put the gears in good condition. Over against this, however, a gear lapping machine should not be considered as a means of correcting tooth form or spacing, except in a very slight degree. Lapping removes all roughness that may be left on the tooth surfaces by a grinding wheel. Some firms supply gear tooth shavers, gear grinders and



Two close-up views of the machine using two fly cutters for chamfering and burring straight bevel, spiral bevel or hypoid pinion teeth, on both ends at once and in one setting. In addition to being adjustable for height, the cutter spindle units carry quills for axial adjustment, to obtain just the right chamfer. Also, the work and the cutters can be adjusted radially and independently of one another.

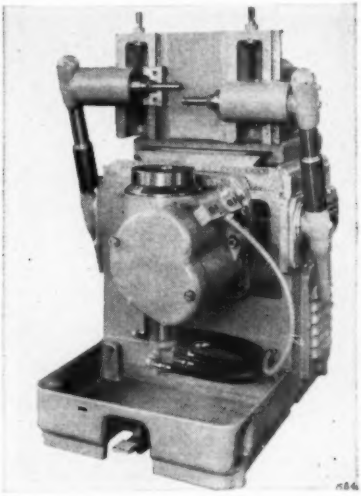


Left side view of the machine using two fly cutters to chamfer and burr gear teeth. Here, a helical gear is shown mounted, and the cutter shafts are adjusted properly to make the cut. The height of these spindles or shafts is easily adjusted by applying a wrench to the top ends of the adjustment screws, which can be clearly seen.

also gear lapping machines, thus providing a full gear finishing layout, at least in a limited sense.

Some gear grinding machines will not only grind both internal and external gears, but can also be used for spline grinding and shaping. Equipped with special attachments, these machines will handle grinding on helical internals and externals, as well as tapered and helical splines. Some machines developed for grinding gears handle the grinding of racks and serrations, in addition to a full range of gear grinding. One very interesting gear tooth grinder, carries the grinding wheel in the head of a ram, similar to a shaper ram, so the wheel can be reciprocated with positive truth. There is arranged a combination movement of the ram, and rotation of the gear being ground, which permits surfaces of two adjacent gear teeth to be generated simultaneously. This machine is so arranged that it stops automatically after the gear has been indexed all the way around, and all of the teeth ground.

One of the interesting advances in gear tooth grinding is the development of grinding oils that provide free cutting, when the grit size of a wheel is reduced far below what could be used to advantage in former years. One such oil has been observed, which in some cases has made it possible to reduce grit size from 60 to as small as 180 to 240. This obviously means that closer corrective results can be obtained in grinding, and a finer finish, so the lapping



This is a front view of the machine which chamfers and burrs both ends of the teeth on straight bevel, spiral bevel or hypoid pinion teeth at one time and in one setting. The work mounting head in the foreground is shown in vertical position (without any work mounted) but can be set at an angle to either right or left when necessary. Note the horizontal, extended spindles which carry the two fly cutters. Each of these spindles is adjustable for height on the front of the cutterhead, to which the spindle housing is gibbed, and the connecting spindles thru which power for the cutters is derived are telescopic, to compensate for both this adjustment, and for the advancing and retracting movement of the cutterhead at the beginning and end of the operation on each piece of work.

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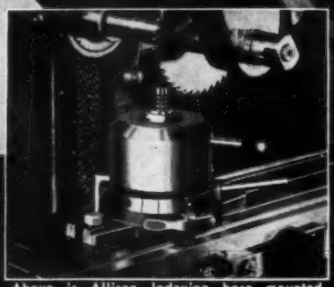

Above is Allison Indexing base mounted with an Allison #1 chuck doing second operation work.

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operation is simpler, and need be depended on less for any correction in tooth form. The same type of grinding oil is being used extensively in worm grinding, spline grinding, and other particular operations.

A right hand view of the machine using two fly cutters for burring and chamfering gear teeth of different kinds, such as straight bevel, spiral bevel and hypoid pinions, is here shown.

Gear lapping machines are made by various manufacturers of gear production machinery. One manufacturer specializing in gear shapers, for instance, has developed a gear lapping machine which has three gear-like laps, running in mesh with the gear being lapped. Provision is made for throwing a load on any or all of the three laps, in either direction of rotation, by means of an incorporated brake on each lap spindle. The gear being lapped is given an endwise motion between the laps, during the process. Lapping compounds used are usually an abrasive of fine type, suspended in oil, in such manner that it can be pumped continually to the revolving work. Manufacturers of any gear lapping ma-

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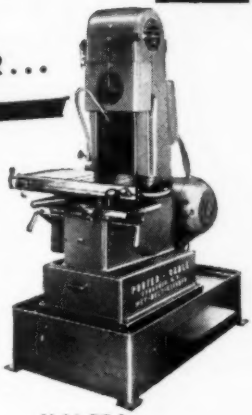

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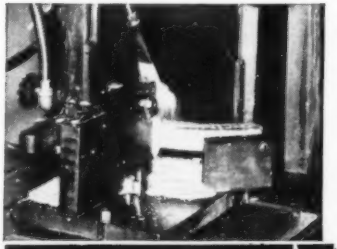

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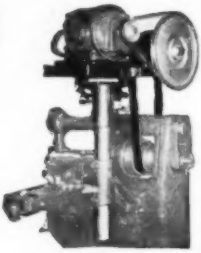

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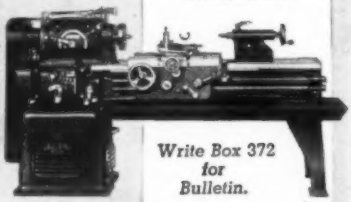

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chine are in position to give specific recommendations with regard to a suitable lapping compound.

One manufacturer of machines for generating spiral bevel gears, also provides a lapping machine for them, in which a pinion is run in mesh with the gear, in the same manner in which it will later run in a finished machine, but with the difference that provision is made for varying the meshing position of the pinion and gear, while the lapping operation is in process. In this way, the teeth are corrected at all points. The lapping compound is circulated and carried to the gear being lapped by means of a pump, as before mentioned.

One different type of lapping for external gears is interesting, in that a lap of female type is used. A steel chill is used in making the lap. This steel chill is of the form of the gear to be lapped. The lap itself is cast around it, in such manner that it is several times as long as the gear face is wide. The idea is to reciprocate the gear thru this female lap, and, in the case of helical gears, to govern the rotary movement of the gear positively thru the proper helix angle. The latter is done by means of a cam on the spindle of the machine which reciprocates the gear.

The arrangement is such that a torque load or lateral pressure is exerted, as the gear reciprocates thru the lap at relatively high speed. After a predetermined number of strokes have been made, with the gear in a given position in the lap, the machine pulls it entirely out of the lap, indexes it thru as many teeth as desired, and again carries it into the lap, to repeat the reciprocating process. Some favor this lapping method quite highly. The torque or lateral load can be exerted first in one direction and then in the other, to lap both sides of the teeth properly. Such a lap is claimed by many to increase in accuracy with continued use. In this process, paste lapping compound is applied with a brush.

Did you know that outstanding machines have been produced for pointing, chamfering and burring gear teeth? Some of these are remarkable in design. The arrangement on one machine

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is such that two fly cutters, carried on the extended ends of two arbors, rotate at high speed, and in synchronized relationship with the rotation of the gear being burred and chamfered. The cutting action is quite similar to gear hobbing, but it is much faster. The cutters used are very simple, being ground from ordinary tool bits, by the same method used for sharpening lathe or shaper tools. The operation is automatic, and when a piece of work has been finished, the machine stops.

Incidentally, the special cutterhead carrying the two cutter arbors is arranged with a sliding motion on horizontal ways. It slides forward at the beginning of the operation, to where the fly cutters engage the teeth of the gear. When the operation is complete, and the machine stops for unloading the gear and loading another, the cutterhead has again retracted to the rear position, so it is entirely out of the way. This machine will handle straight bevel, spiral bevel or hypoid pinion teeth. The same firm making it has produced a full line of machines, for burring and chamfering all kinds of gear teeth. Some of these use "pencil point" cutters; some use inserted blade cutters, and some make use of two fly cutters, like the machine illustrated. Machines for pointing internal or external gear teeth, made by the same company, employ a hollow mill type of cutter for the purpose.

Other machines of highly special type have been devised and built by this company, for performing out-of-the-ordinary gear finishing operations. One, for instance, was built to generate three special teeth to accurate form, in the recessed hub of an automobile second-speed transmission gear. Another machine made by them is known as a gear tooth thinner. This machine takes spur gears which are used in a special gear locking mechanism, and thins the teeth, by removing stock from both sides of each tooth, for about one-third of the span of the tooth face, the relieved portion of the teeth being in the center of the face span. Using an endmill, pointed type of cutter, a spindle advances it axially into the cut, moves it laterally while revolving, to make the required length of thinning cut, then retracts and returns it to the position it held in the beginning, to complete one cycle. The gear is indexed one tooth, while the return movement of the cutter takes place.

(Photos, courtesy Cross Gear & Machine Co., Detroit, Mich.)

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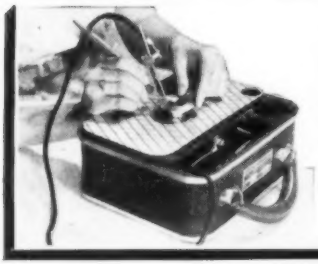

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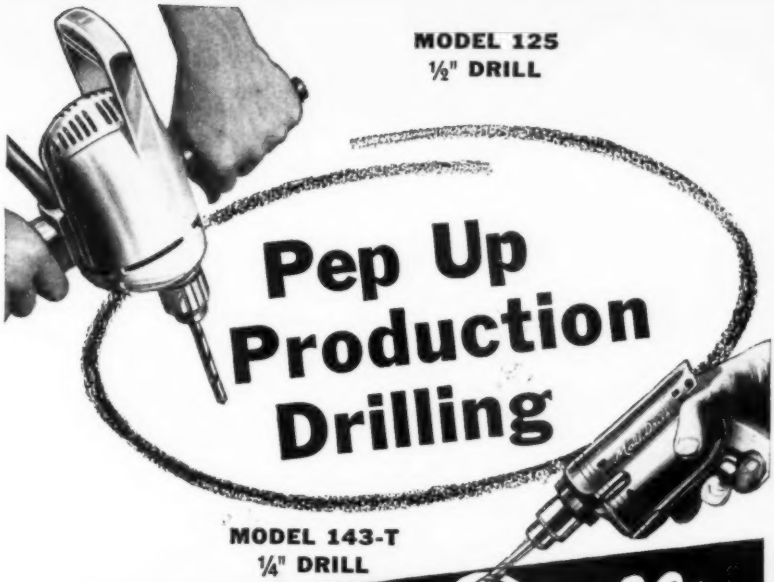

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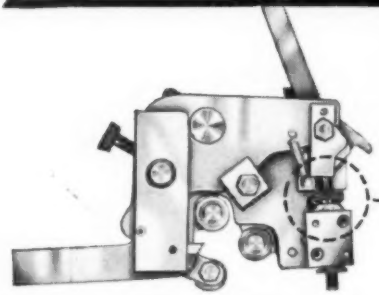

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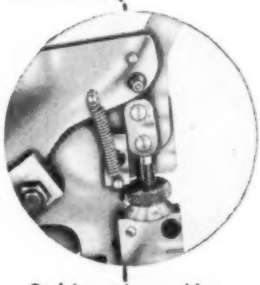
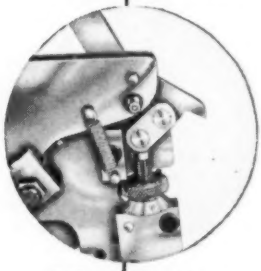


Tool in cutting position.



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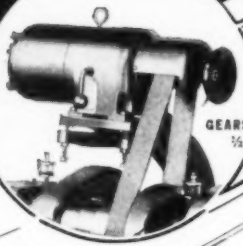

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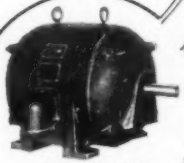

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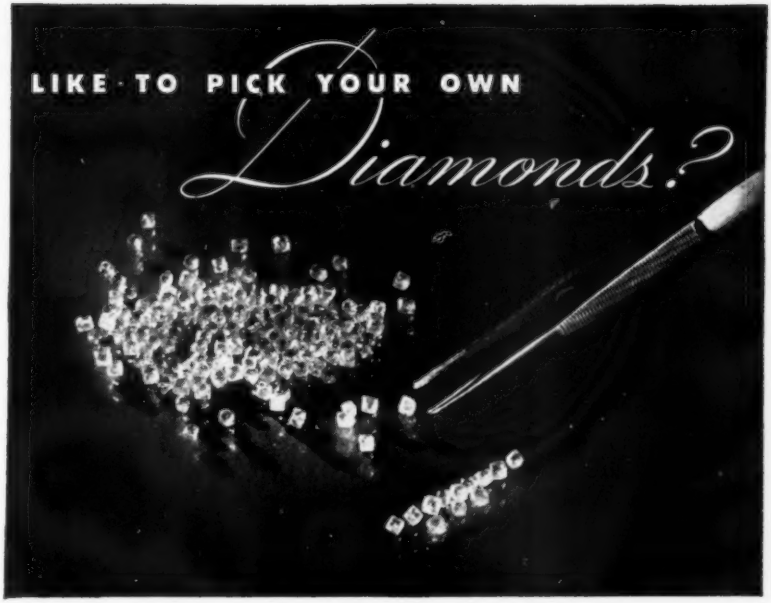

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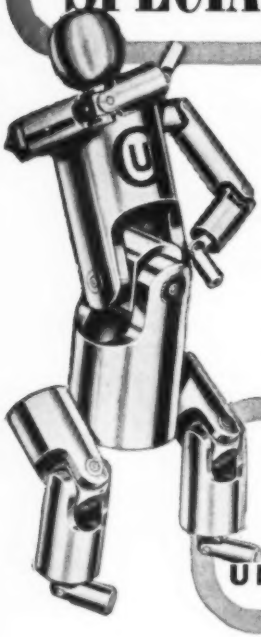

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Versatility of the Ball

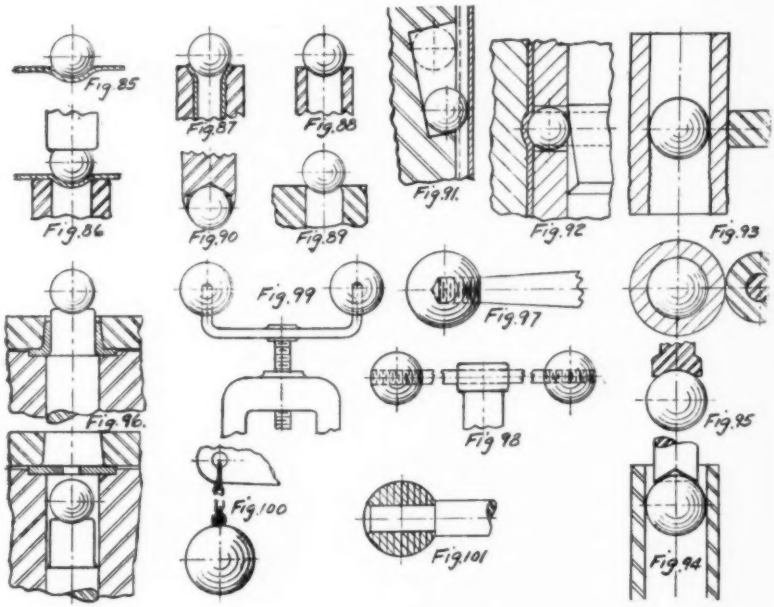
PART IV — MODERN MACHINERY APPLICATIONS

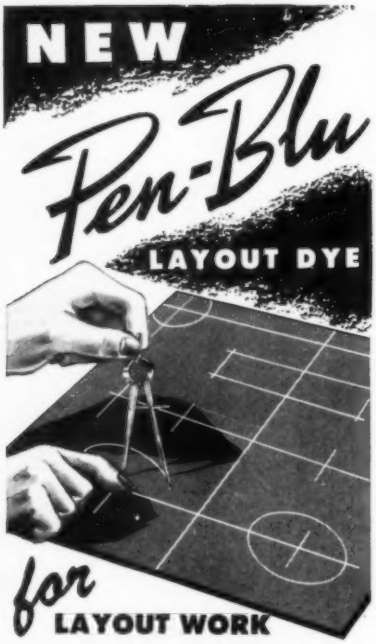
By H. F. WILLIAMS

IN the previous installments of this series, the applications of the ball have been shown as thrust and pivot bearings, clamping shoes, locking devices, retaining units, detents or locators, locks in shifting mechanisms and for spring centering. Its use was also portrayed as an equalizing member for fixtures and in various types of couplings, safety clutches and in ratchets.

In the next two installments, the versatility of the ball in modern machinery is further considered. Not only can it be used to function as an antifriction part on the one hand and a frictional component on the other, but it can be applied as a metal forming tool, a handle, sizing device, gauge, center, swivel, pressing tool, valve and as an equalizer in vise and other holding arrangements.

Uses of the sphere as a forming tool are shown in Figs. 85 to 93 inclusive. Because of the hardness of a polished steel ball, it is ideally suited for light forming jobs, both on a production basis as well as a makeshift tool. In Fig. 85 it was required to form a dimple in a thin piece of sheet metal. A block of hard wood with a suitable depression was used as a base. The ball was simply held between the thumb and finger and





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tapped with several smart blows, using a brass hammer. For faster and more even forming, the disk was placed against the wooden piece and the ball held against the proper place on the disk and all three pieces placed between the jaws of a bench vise and squeezed.

Another method for making dimples in sheet metal pieces is illustrated in Fig. 86. Either the ball can be flattened as shown or the end of the arbor press ram can be cupped out to accommodate the ball. A steel die is used in this application, the hole being shaped to suit at the opening. As shown, a sharp corner on the lower side of the work was desired.

Both copper and light gauge steel tubing can be flanged in a "homemade" die as in Fig. 87, when a regular forming tool is not available. The die is countersunk to the required angle and the tube is expanded in this bell mouthed hole as shown.

A number of tubes had to be burred at each end of the hole. The method in Fig. 88 saved the making of a burring tool and did a satisfactory job. Here too the ball is struck with a hammer, the result being a slight chamfer. In this instance it was more desirable to have a smooth entrance to the hole than to have a perfectly square end surface. However, it was found that the proper size ball had to be used, otherwise the opposite effect resulted. If a larger ball is used, a peening of the metal takes place. This method can be effectively used where a pin or screw has to be prevented from coming out of a hole. As in Fig. 89, the edges are rolled inwards to form a keeper for a pin or screw.

In all these foregoing applications, a punch as shown in Fig. 90 can be used. A piece of drill rod is tapered at the end and drilled out as shown. The ball is swaged in tightly and the rod is polished off to blend smoothly into the ball. The top of the punch is hardened but drawn back to a deep straw color so it will not be too hard.

Fig. 91 shows a method used for making a flute or flutes in a thin walled tube. A hardened steel ball for each flute is pocketed in a slot of a circular forming die. The punch is fluted. In the

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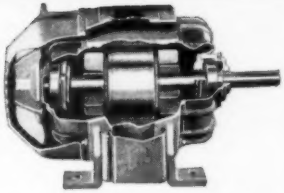

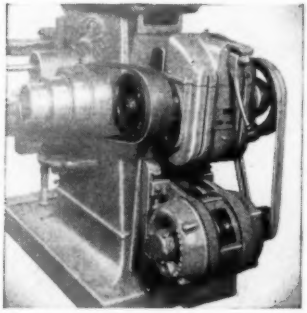

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sketch, the axis of the punch is at the right altho it is not shown. The pocket in the die is machined at approximately a 12° angle and is long enough so that before the fluting operation is performed, the ball clears itself of the tubing being formed. In its lower or working position the ball protrudes into the hole in the die sufficiently for the required depth of the flute. The work is placed on the punch and forced thru the die to form the flutes. As the punch and work are withdrawn, the balls are rolled upwards and to the deepest part of the tapered pocket thus relieving the contact between ball and flute.

In another method of forming in which a series of balls act as the forming medium as portrayed in Fig. 92, a thin tube is fastened permanently into the bore of a casting. A partially circular groove is machined into the wall of the hole. After the tube has been inserted into the hole, a rotating sleeve is lowered into the tube. Equally spaced holes in the sleeve accommodate hardened and polished steel balls. A spindle rotating with the sleeve but free to slide within the sleeve, has a tapered groove machined on its periphery. The assembly shows the balls in position at the end of the spinning operation. Previously the spindle was positioned so that the balls contacted the tapered slot at its smallest diameter.

Final sizing of the holes by the use of a ball is not new, having been suggested a number of years ago. However there are recent developments of interest to the reader and these are briefly enumerated here. The term, finish-sizing, ball-broaching, burnishing and press-finishing are applied to this operation. From its numerous applications it is becoming an accepted way, not only of controlling hole size but also of work-hardening the wall surface of the hole. This type of broaching is not a cutting or chip removing operation. Rather it is a smearing of the crests or high points of a finished surface into the depressions or valleys.

This is illustrated in Fig. 93 where a ball simultaneously is forced thru the hole and a roller pressed against the outside of a rotating piece. The ball is

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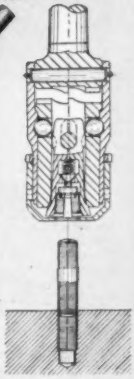
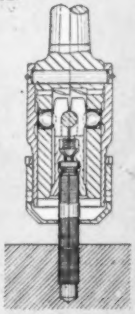
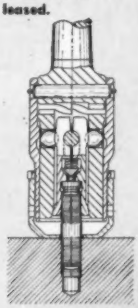
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



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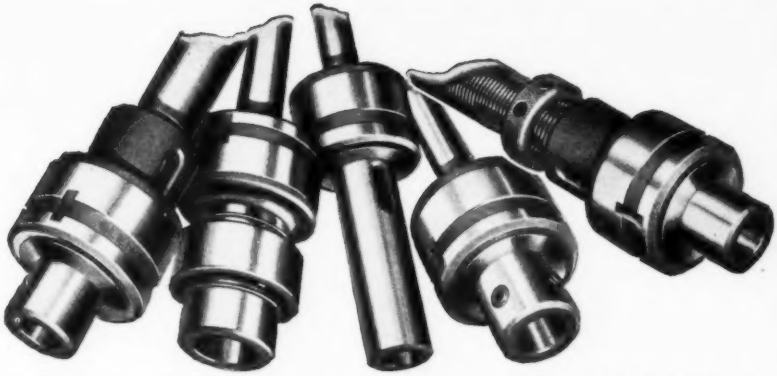
always opposite the roller, both being moved at the same rate of speed. The lower half of the upper view has been drawn with wavy and rough surfaces to show the effect of the burnishing operation. Actually only about .001" is left on a ground surface for finishing.

The bearing sleeve in Fig. 94 is being ball-broached in the customary method, that of using a press. Here the sleeve does not rotate as that in Fig. 93. The punch or ram of the press accommodates a tool, the end of which is recessed as shown in Figs. 94 and 95, depending on the choice of the user.

Balls made of tungsten carbide are also available. It is claimed that the modulus of elasticity of a carbide ball is several times that of a hardened and polished steel ball and therefore it resists wear and abrasion longer. In the September 1944 issue of the BLUE BOOK on pages 206 and 208 there appeared an article under the title of "Sizing Holes with Carbide Balls" which gives a comparison of the use of carbide and steel balls. In brief, this article says that the cost of both types of balls are about the same, but the cost of inspection and possibility of defective work is decreased. As an example, a ½" diameter carbide ball costs approximately $3.00 while a 1½" steel ball costs $0.03. The carbide ball produced 60,000 to 68,000 operations while the steel ball produced 600 to 800 operations. In both cases the ratio was about 100 to 1. It was claimed therefore that the carbide ball did the work of 100 steel balls. In a run of 60,000 broaching operations the number of inspections was reduced from 5,000 to 50. The article also stated that blind holes could be ball broached in that a steel shank was brazed to a carbide ball by which it could be extracted from the hole.

Whether a steel ball or one made of tungsten carbide is used, it has been found that the walls of a hole finished in this manner takes on the luster of a mirror. The Brinell hardness of the hole surface is increased, thereby increasing wear resistance. Sizing of the hole it is claimed, can be controlled more readily than by the use of other methods of finishing.

An excellent and unusual example of extrusion in a press by the use of a ball



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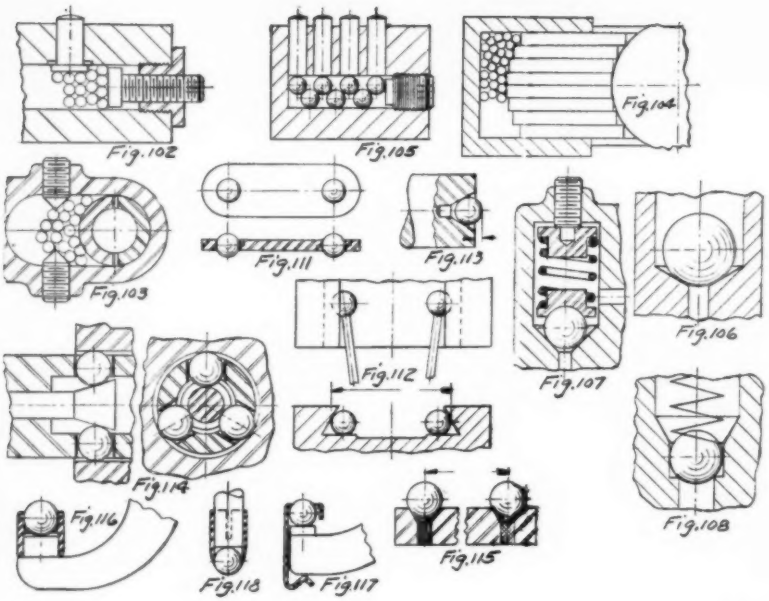
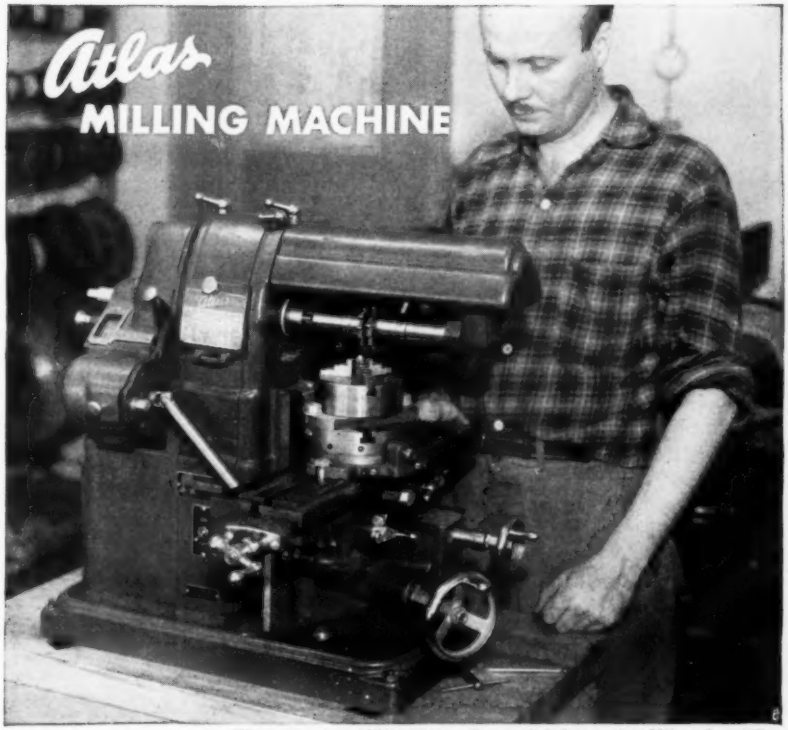


is illustrated in Fig. 96. The sketch is shown diagrammatically only and is not intended to be a detailed drawing of the operation. The ball rests on a post cupped out on the upper face as shown in the lower view. The work blank, in which there is a hole, rests in the die above the ball. As the die slides downward on the post, the work disk is forced over the ball to extrude it into the shape shown in the upper view.

A spherical shape has long been used as a knob or handle on levers, cranks, spiders, rods and other forms where a smooth grip is desired. Figs. 97 to 101 inclusive show some examples. In Fig. 97 as in the next 3 illustrations, the ball is used unheattreated so that it can be machined. A blind hole is tapped to fit the end of a cast lever. In Fig. 98 the balls also are attached by threading. The sketch represents a chuck wrench on which the balls were placed to prevent the hands from slipping off during the tightening and loosening operations. The balls are held on by wedging them on the imperfect threads left by the die head when threading the rod.

In Fig. 99 a handle is fastened to the upper end of the screw on a screw press. Because of the long travel necessary and the slowness with which the screw advanced, the ends of the handle were turned upwards and two large balls were fastened thereon. This imparted a flywheel effect to the handle when spun, thereby advancing the screw more rapidly.

In Fig. 100, a ball was suspended by a chain hung on a lever. This was for a double purpose. Not only was it easier to catch the chain with the hand but the weight of the ball kept the chain hanging in its proper location. In all of these sketches, the balls had to be drilled or tapped. Altho they had to have a comparatively smooth surface, it was not required that they be brightly polished; in fact in several instances they were painted like the rest of the machine.



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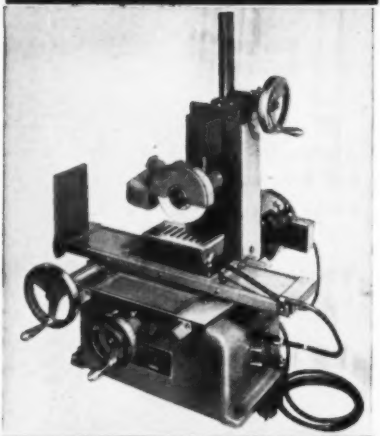

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Balls of plastic and hard rubber are also used as knobs for levers, etc. In Fig. 101 a ball is attached by peening over the end of the rod. Balls made of such material need not be machined to fit the piece to which they are to be fastened. These balls are hot press-formed and the threaded hole can be cast during the same or initial operation. Plastic and hard rubber balls are also formed around the bushings that have been machined to required forms. These inserts are prevented from rotating within the ball by various methods of anchoring. Several universal jigs and fixtures are appearing with clamping levers tipped by such balls. Like free turning machine handles, these knobs can be arranged so they can be gripped in the hand while turning a handwheel yet not rotate in the hand but upon the spindle.

Balls of small diameter can be used in vises, clamps, jigs and fixtures. Pressure is equalized by the balls contacting one another and free to move in any direction. In Fig. 102, a hole under a series of contact plungers is filled with small hardened steel balls. A headed screw with hex wrench hole in the threaded end, forces the balls to exert equal pressure against each loaded plunger. If the plungers are headed as illustrated, means must be provided for easy assembly. Only one plunger is shown and it must be assumed that the ball cavity is filled.

In Fig. 103 is an adjustable clamping member. The sleeve fitting about a rod or cable is split its entire length into two halves. One side of the sleeve at the right fits the outer member. Behind the left-hand half of the sleeve, the space is filled with small balls. Pressure is exerted on the balls with two cone-pointed headless set screws. Equalized pressure forces the half sleeve towards the right clamping on the rod or cable.

The vise shown in Fig. 104 illustrates method of holding irregularly shaped castings. The jaws are made in sections of rectangular shaped steel. When clamping pressure is exerted with the movable jaw (not shown) displacement of the balls allows the sections of the left hand or stationary jaw to arrange themselves according to the contour of the piece to be clamped.

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In Fig. 105, movement of the equalizing plungers is controlled by the use of slightly larger balls than in the three preceding illustrations. There is one ball for each plunger and the balls are so arranged in the cavity that one bears against the other when pressure is placed on the screw.

A ball makes a very efficient seating member in a valve. It will fit into any conically shaped end of a hole whether left by a drill point or in a 90° included angular hole machined with a countersink. It also functions in a counterbored hole having parallel sides. The ball may be made of any material, steel, brass, monel, plastic or glass. The accompanying illustrations show applications of these materials.

In Fig. 106, the ball seals off lubricating oil by gravity. The ball is seated at the bottom of a hole as left by a drill. When enough pressure bears against the bottom of the ball, it is raised to allow oil to enter the reservoir. The valve in Fig. 107 has a spring-backed ball resting in a countersunk hole. Contact is quarter-way up the ball. This sealing line contact is considerable larger than the oil-feeding hole. Pressure can be adjusted against the ball with a screw and self centering spring.

A fine metering valve is shown in Fig. 108. The ball fits against the 90° edge of the hole. The effect is the same as in the other two examples, except in them, the contact ring was perpendicular to the tapering bore. Here the ball is surrounded by the walls of the counter-bored hole. Clearance is very close but large enough to allow freedom for the ball to rise. Oil coming up from under the ball is metered around the ball so that only a slight amount passes by the ball. The spring keeps the ball seated until pressure is exerted against it. The ball in the valve shown in Fig. 109 is pushed from its inverted seat by a rod from above, allowing oil to flow down and out of the small hole at the right. When the rod is lifted, the spring forces the ball against the seat shutting off the oil supply.

A ball made of glass is used in the valve shown in Fig. 110. It is used as a faucet repair device and is manufac-

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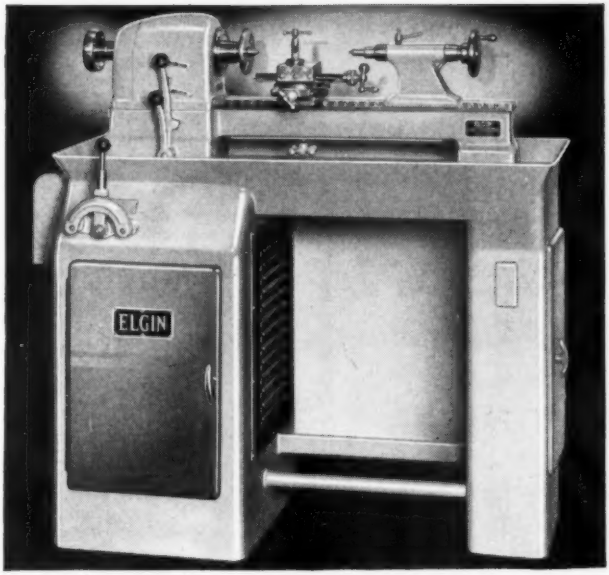

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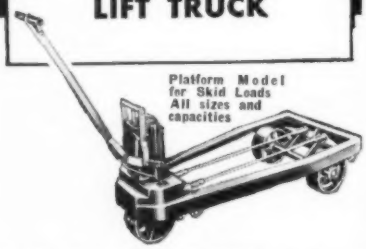

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Synthetic plastic balls are used in valves handling acids, solvents, alkalis and other rust-producing or corroding liquids. In fact, in some instances, the whole valve is made of this material. Some types are impervious to steam, certain oils and alcohol. These balls are lighter than metal and in some instances quieter in operation.

Because of the accuracy of size and sphericity, the hardened and polished steel ball makes an ideal gauging medium and has been applied to various types of measuring devices. In Fig. 111, two balls are used as "go" and "not go" gauges. The balls are pressed into the holes and afterwards staked in. Sizes are stamped on the ball holder. Such gauges have been made with different shaped ends, one end rounded and one squared, so that the figures need not be read when picked up. They have been used as master gauges for setting adjustable snap gauges.

Balls have been attached to the legs of both inside and outside calipers for measuring angular surfaces. In Fig. 112, an inside caliper or divider was so arranged. The balls contact the bearing surfaces of the dovetail and then miked over the balls as the dimension line shows. Accurate reading may be obtained thus. Various forms of circular vee-shaped grooves may be measured with outside calipers with balls attached.

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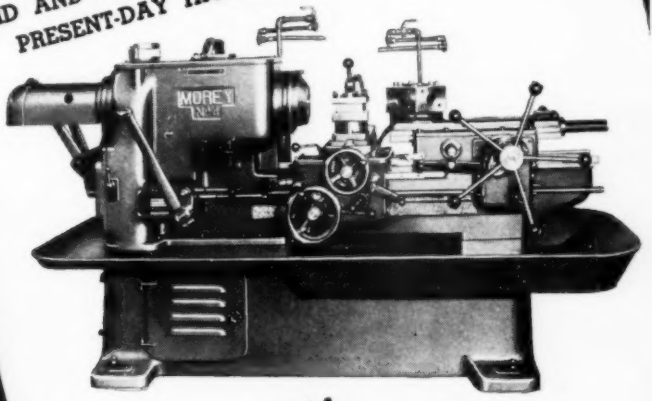

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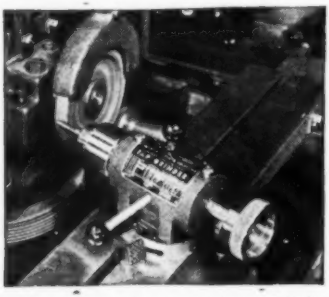

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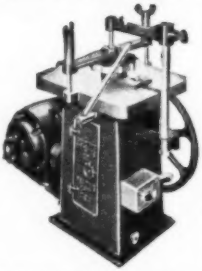

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Because of the necessity of holding shoulder work accurately in some types of ground work, it is required that the center hole be of a certain size. Fig. 113 shows a ball used to gauge the center of the piece of work. While the gauging dimension is given from the ball to the end of the shaft in this illustration, it is often given to the shoulder in question, thereby eliminating one closely held decimal dimension.

In a micrometer type of gauging device as illustrated in Fig. 114, three balls are in contact with an accurately ground coneshaped head of the micrometer screw. The balls fit into close fitting holes equally spaced in a sleeve. As the balls are forced outwards to touch the walls of the bored hole in the work, the dimension of the bore is read on the graduated barrel of the gauge. It can be used to mike deep holes in the work.

Instead of using cylindrical rolls fastened to the end of a sine bar, two accurately sized balls are fastened to the bar as in Fig. 115. Two small holes are bored and countersunk thru the sides, using a jig borer. The holes are accurately spaced. The balls are clamped in the counterbored holes and melted solder is run in thru the small holes. To assure the solder "taking hold" the balls may be ground with slight flats, or several grooves may be ground in. Care should be taken that these ground surfaces do not reach the point of tangency or where the balls come in contact with the tapered holes. Gauge blocks placed under the balls and against the ball-side of the bar, line it up so that the upper surface is in the proper plane.

The ordinary outside micrometer cannot be used to mike the thickness of wall in bored cylindrical work such as sleeves, tubes or other forms in which circular grooves are machined. However, if a ball is used and held against the anvil of the micrometer such measurements may be taken by making due allowance for the size of the ball used. It is not always convenient to hold the ball with the fingers so a cage as shown in Fig. 116 can be made to hold the ball firmly in place. A brass sleeve is shoulder bored against which the ball rests when not assembled to the mike. The upper end after the ball

If You can
CHUCK *it*
You can
THREAD *it on . . .*

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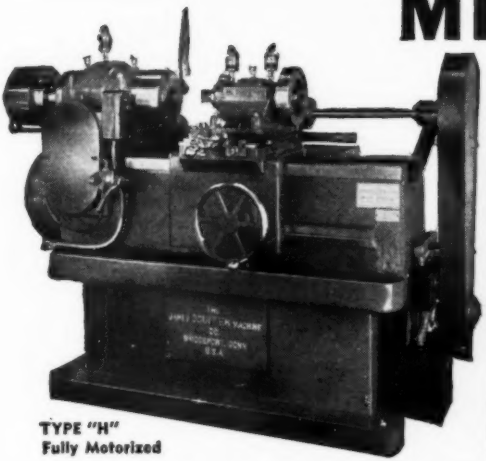

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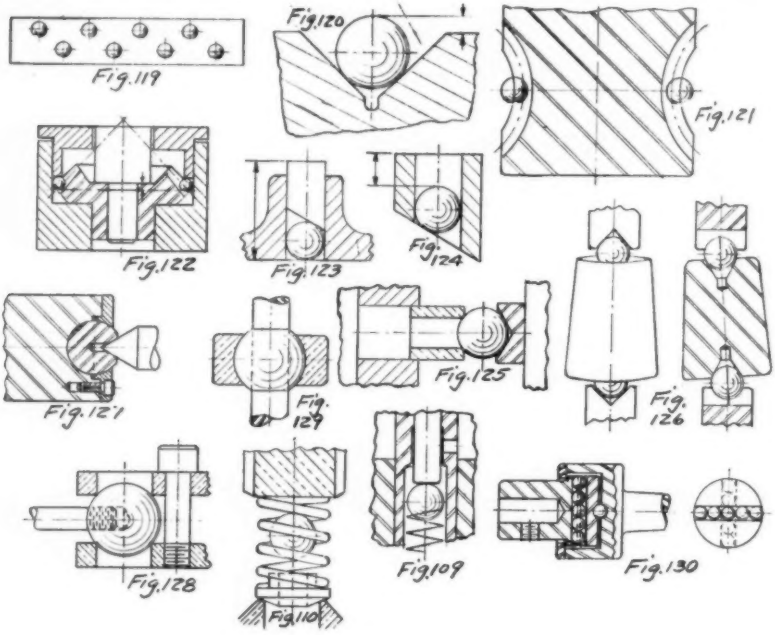
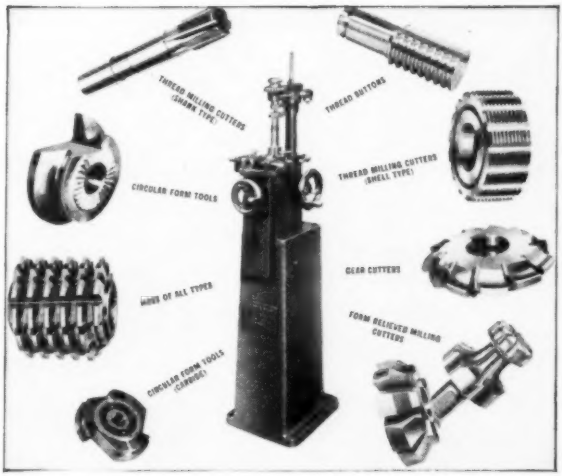
is in place is gently staked around the ball. If used frequently where it must be attached and removed, the hole will wear sufficiently to prevent a snug fit over the anvil. The lower end is then sawed in three places and these ends squeezed in a trifle. It will be found that it then snaps on tightly.

In Fig. 117 another method is used to hold the ball against the anvil. A thin piece of sheet metal is drilled out on the upper surface of the piece, shaped as shown. This hole is smaller than the ball. The lower part is formed as a hook. Snapped on, there is enough spring in the piece to bite into the frame of the micrometer. Sometimes the upper part or spindle of the mike needs such an attachment as shown in Fig. 118, especially if an external circular shaped groove is measured from within the bore of the work. Here a piece of tubing, steel or brass is swaged lightly over the ball and polished off to produce a feather edge. The upper end is slotted in several places for proper spring when attached. The length of this sleeve should be in the proportion as shown.

A parallel bar, such as might be used on a drill press can be made to operate more readily for heavy work, if balls are used as shown in Fig. 119. They may be of any size desired but the balls used should be of identical diameter. The holes are drilled with a slight clearance for freedom of the balls. The balls are then staked in with a sharp-edged circular staking tool. It is important not to stake too hard because the ball must be free to rotate. When heavy work rests on several of these parallels, it is easy to slide the work under the drill, reamer, counterbore or other tool for proper alignment.

Vee-guideways as illustrated in Fig. 120 can be measured with a ball in lieu of a specially hardened and ground roller or gauge bar. Knowing the included angle and the width or depth





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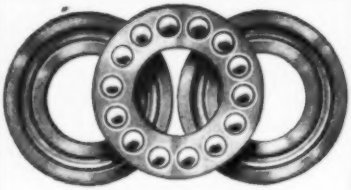

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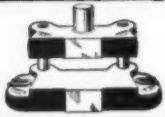

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of the groove, the dimension as shown for the gauge block may readily be calculated. Grooves having one straight and one angular surface also fall in this category.

Worm gear teeth may be measured by using balls as in Fig. 121. Here the balls roll into the lowest part of the tooth spaces when a slight pressure is exerted by the micrometer. Straight and helical gears can also be gauged in this manner. This method of using balls in measuring for correct pitch diameter may not be the best way for the two latter mentioned gears, but it is probably the most efficient way for worm gears.

In Fig. 122, a measuring gauge is made for miter gears. It is not the pitch diameter that is checked here, but because the distance shown by the arrows had to be held to close limits. In fact these miter gears had to be interchangeable without end play. The gear hub fits accurately the hole in the fixture base. The large bore above has a known clearance over the outside diameter. Three or four identically sized balls are dropped into the teeth spaces after which a hardened and ground center plug and outer ring are assembled. An indicator is slid over the upper faces of both gauges which must be flush. The end of the outer ring rests on the balls at the time the measurement is taken.

Pieces cut off angularly, which are held to close dimensions as illustrated in Figs. 123 and 124 may be efficiently and accurately gauged. In Fig. 123, the assembly does double duty. First the flange (not shown) is fastened to a base. The ball is dropped into the hole against which rests the pin that has been machined at an angle. The pin is then held in place by a brass tipped set screw, mostly to prevent rotation. The top of the pin is then surface ground to the desired height shown by the arrows. Afterwards, during the inspection procedure, the same fixture is used but the pin is not held by the set screw. The height shown is checked to a size block. The hole and ball diameter are the same.

In Fig. 124, the sleeve, cut off at an angle, is gauged by the use of a ball. Here also, the hole and ball size are identical. The bushing is clamped to a

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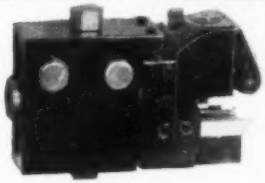

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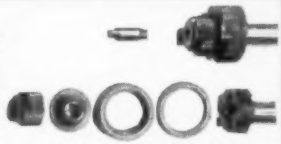

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parallel and the measurement as shown is taken from the ball. Similar sleeves having larger holes or odd sized holes for which a ball is not available, also can be measured. Because the smaller ball will roll down the face of the parallel to the lowest point in the hole, the given dimension shown can be accurately controlled.

A bushing may be pressed into a plate as shown in Fig. 125. The method makes use of a ball as an equalizer. The bushing is started into the hole and together with the ball and the ball backing plug, are placed between the jaws of a bench vise. As the handle is turned, the vise screw advances slowly and evenly to press the bushing into place.

An unusual roller assembly is shown in Fig. 126 in which a rotating, tapered burnishing roll, is centered on two hardened and ground steel balls, the three pieces having freedom laterally. The balls fit into the 60° center holes of the hardened and ground rolls. A central tapered roller (not shown) forces the small roller illustrated, to the left, the left hand side of the latter travelling outwards in a vertical plane. The balls ride in 90° included, vee guides as shown in the view at the left. Tremendous pressure is exerted against the small roll during the burnishing operation but the balls allow rotating and lateral freedom.

Because of the angular misalignment in turning tapered work in which there is considerable difference between large and small diameters, accuracy of taper cannot be maintained when plain center holes are used in an arbor. The ball center shown in Fig. 127 compensates for this discrepancy. The ends of the arbor are bored out with a hemispherical hole to accommodate the ball. Where it is not possible to have such a shaped end, a lapped-out countersunk hole might suffice. In either event, a cap is fastened to the end of the arbor to retain the ball. For proper fit on the ball, the cap may be shimmed. During the machining operation, with the arbor mounted between centers, the arbor oscillates on the balls. Necessary lubricating facilities must be provided.

In tool room and machine shop work it is sometimes necessary to obtain a combination of rotating or oscillating

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and sliding movements. While this is possible in the ordinary universal joint where the swivel pins are in planes perpendicular to one another, the ball offers a simple means for getting such movements. In Fig. 128 a swivel for a small vise is shown. The jaws either side of the ball are adjustably clamped with the screw as shown. The ball is tapped for the rod that holds the vise. With this arrangement, the work in the vise can be held in any compound angular position.

In Fig. 129, a piece of stock, slightly wider than the ball diameter is drilled and reamed for proper sliding fit. It is then slabbed off on each side to the proper thickness to allow for angular positioning. This then forms two prongs along which the ball is free to slide and between which the ball can oscillate.

The ball coupling illustrated in Fig. 130 uses balls for floating purposes instead of the slot and key type of disk. While the sketch shows a floating reamer holder, the same method can be applied to other types of work. Because balls offer a freer movement, greater sensitivity is obtained. The piece between the series of balls and as shown in the end view at the right, is grooved to fit the balls freely. The grooves are perpendicular to one another so that float is possible in both directions. Applied to the end of a chuck or other form of rotating clamp fixture, having greater diameter or swing than that shown, the floating disk may be provided with two rows of balls across each face, spaced well apart. With some distance apart the four rows of balls give greater rigidity than is possible with a single row each side of the disk.

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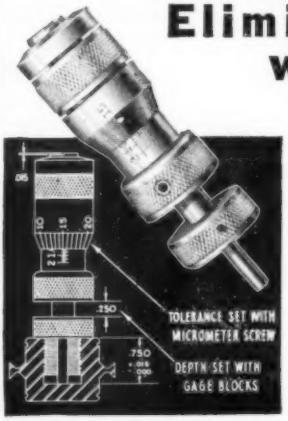

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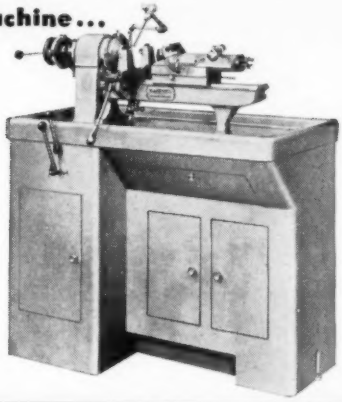

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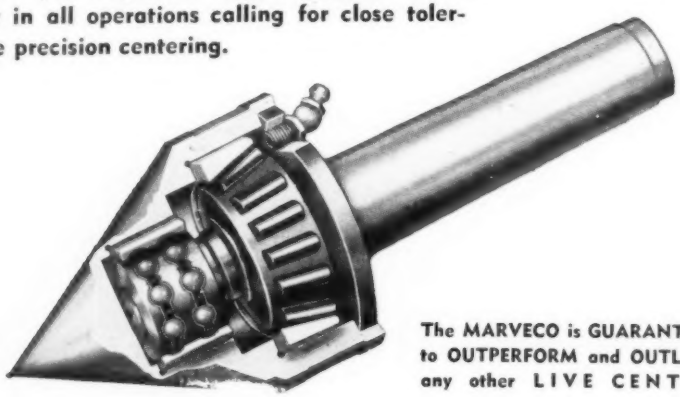

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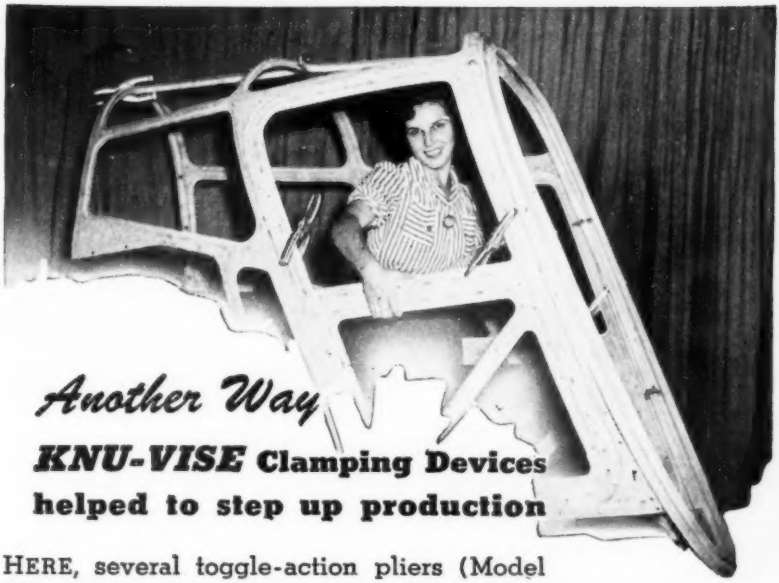

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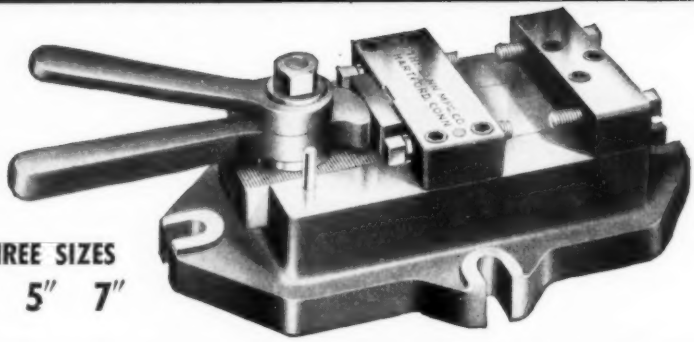

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(With Special Reference to Thread Grinding)

By JOHN W. KING

THE 13 change gears furnished with 6x36" Jones & Lamson Automatic Thread Grinders for grinding leads, measured in inches, were picked so that one or more of them have numbers of teeth which are divisible by every number between one and 27 except 17, 19 and 25. One set of 13 standard change gears for the lead change gear housing includes one each of these toothed gears:— 24; 30; 32; 36; 40; 46; 48; 52; 56; 60; 66; 72; 96.

From these 13 change gears may be selected gears for grinding almost any lead (in inches). Four kinds of leads which may require one or more gears in addition to the 13 standard ones are:

1—In case of an extremely long lead, or an extremely short lead, some of the 13 gears may not be large enough. For example, it might be necessary to use an 80 or 100 tooth gear instead of the 60 tooth gear furnished as standard equipment. (This case is uncommon).

2—The numerator or denominator of the fraction of some of the less common leads may be divisible by 17, 19, 25 or other numbers which are not divisible into any of the 13 standard change gears. If the numerator or denominator of a lead is divisible by 19, for example, it is necessary to use a gear such as a 57 tooth gear in the gear train, if an exact ratio is desired, since 57 is divisible by 19.

3—Leads which are lengthened or shortened by small amounts may require change gears other than the 13 furnished with the machine.

4—Diametrical leads contain pi in the ratio, and usually require gears in addition to the 13 standard change gears. Diametrical leads can be figured more easily if the gears 71 and 113 are available:

$$\frac{(71}{113} = \frac{pi)}{5}$$

Sample Computations

The change gear ratio for leads measured in inches for the 6x36" Thread Grinder equals 5x lead (in inches); or, 1 x lead (in inches) if back gears are used.

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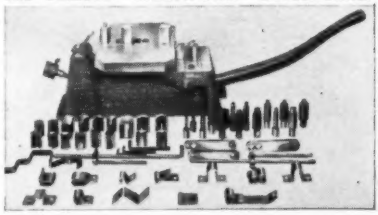

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Given the lead .41250—Determine a set of change gears.

The fractional equivalent of .41250 $= \frac{33}{80}$

Therefore, $\frac{.41250}{1} = \frac{33}{80}$

NOTE:—If the fractional equivalent of a given lead is not readily discernible, usually it can be determined by means of a table of decimal equivalents, such as is included in the book entitled "14000 Gear Ratios", published by the Industrial Press, 148 Lafayette St., New York, N.Y. Without back gears the change gear ratio $\frac{5}{1} \times \frac{.41250}{1}$ or $\frac{5}{1} \times \frac{33}{80}$

Thus 33 is divisible by 11, and 80 is divisible by 5. Since change gears are furnished in the set of 13 which are divisible by 11, and 5, it is simply a matter of arithmetic to pick out four suitable change gears:

$$\frac{5}{1} \times \frac{33}{80} = \frac{5}{1} \times \frac{33}{80} \times \frac{2}{2} = \frac{5}{2} \times \frac{66}{80} = \frac{5}{4} \times \frac{66}{40} =$$

$$\frac{5}{4} \times \frac{66}{40} \times \frac{12}{12} = \frac{\overset{A}{60}}{\underset{B}{48}} \times \frac{\overset{C}{66}}{\underset{D}{40}} = \text{Ans.}$$

This is a suitable set of change gears for the lead .41250 using gears which are among the 13 standard gears. Always check to be sure a proposed set of gears will fit into the change gear housing; and that the gear on the leadscrew is large enough to provide adequate lubrication by dipping into the oil reservoir.

Given the lead .47368—Determine a set of change gears.

Referring to a table of fractional equivalents, we find that, the fractional equivalent of .47368 is 9/19.

Therefore, the change gear ratio may be written, $\frac{5}{1} \times \frac{9}{19}$.

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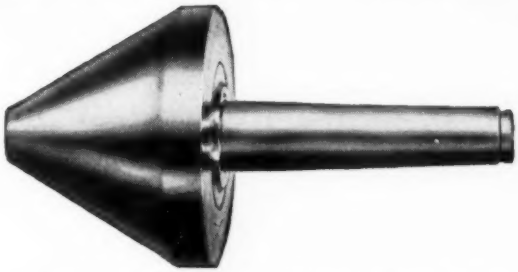

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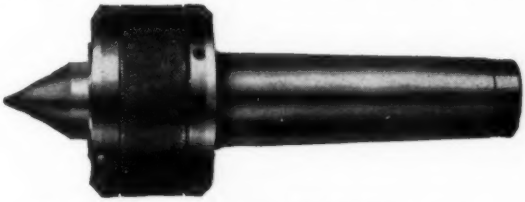

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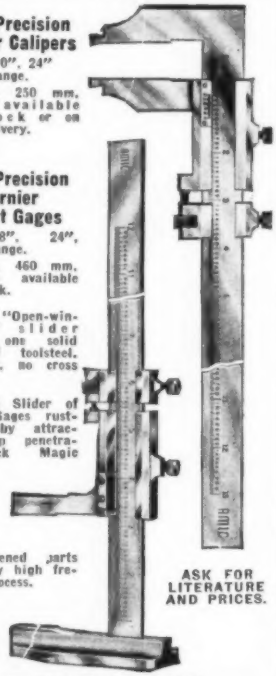

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It will be noticed that this particular ratio contains a 19, and since none of the 13 change gears are divisible by 19, it will be necessary to use a gear, the number of whose teeth is divisible by 19. 57 makes a good sized gear with its number of teeth divisible by 19.

Continuing the computations by arithmetic,

$$\frac{5}{1} \times \frac{9}{19} = \frac{5}{1} \times \frac{27}{57} = \frac{5 \times 3 \times 9}{1 \times 57} = \frac{3}{1} \times \frac{45}{57} =$$

(A) (C)

$$\frac{96}{32} \times \frac{45}{57} = \frac{4 \times 24 \times 3 \times 15}{32 \times 57} = \frac{72}{32} \times \frac{60}{57} \text{ Ans.}$$

(B) (D)

It is seen that a 57 tooth gear is the only one required which is not one of the 13 standard ones. The same principles are used to figure gears for grinding diametrical; and metric pitches; etc.

Ordinarily the fractional equivalent of a given lead can be determined, and a solution made as indicated. However, in the case of change gear ratios for which there are not any exact solutions, and for those change gear ratios which do not have exact solutions obtainable with four of the 13 standard gears, one or both of these equations can be used:

(B x D) x desired change gear ratio = (A x C)

$$\frac{A \times C}{\text{Desired change gear ratio}} = (B \times D)$$

A table of values of (B x D), or of (A x C) using the 13 standard change gears follows. (If additional gears are available in a given plant, this table can be enlarged, if desired). By substituting all possible values of (B x D) and all values of (A x C), these equations have 36 possible solutions. However, a suitable solution for any given change gear ratio can usually be made with only a few solutions at most, of whichever equation is most convenient.

Some of these solutions will be prime numbers, or numbers with decimal fractions which are not large enough, or small enough for desired accuracy. Also some combinations have gears

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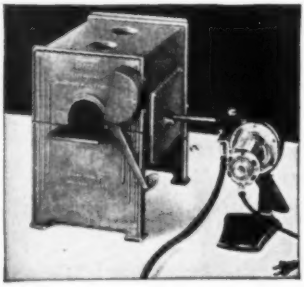

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which are too small to mesh in the change gear housing. Even so, in every case these two equations give several accurate approximations for any given ratio.

Such solutions are made more quickly and easily, if a table of factors, (1 to 10,000), and a calculating machine are available. Tables of factors (1 to 14,400) are included in the book "14,000 Gear Ratios" already mentioned.

TABLE OF VALUES OF (A × C), OR OF (B × D) USING 13 STANDARD GEARS

(Note: More products can be obtained by multiplying pairs of two of these 13 gears. However, additional ones would be simply multiples of the ones listed.)

24	× 30	=	720	30	× 60	=	1800
24	× 32	=	768	40	× 46	=	1840
24	× 36	=	864	36	× 52	=	1872
24	× 40	=	960	30	× 66	=	1980
30	× 36	=	1080	36	× 56	=	2016
24	× 46	=	1104	40	× 52	=	2080
24	× 48	=	1152	32	× 66	=	2112
30	× 40	=	1200	40	× 56	=	2240
24	× 52	=	1248	36	× 66	=	2376
32	× 40	=	1280	46	× 52	=	2392
30	× 46	=	1380	46	× 56	=	2576
32	× 46	=	1472	40	× 66	=	2640
30	× 52	=	1560	48	× 56	=	2688
24	× 66	=	1584	46	× 60	=	2760
36	× 46	=	1656	48	× 60	=	2880
32	× 52	=	1664	52	× 56	=	2912
30	× 56	=	1680	46	× 66	=	3036
32	× 56	=	1792	32	× 96	=	3072

EXAMPLE

Given any odd lead, say .1028248 inches.

Change gear ratio = 5 × .1028248 = .5141240

Take a few numbers from the table which will give gear combinations which will mesh:

$$\frac{(A \times C)}{.5141240} = \frac{40 \times 66}{.5141240} = \frac{2640}{.5141240} = 5134.94798 = 5135 = 65 \times 79 \quad (B \times D)$$

$$\frac{(A \times C)}{.5141240} = \frac{48 \times 56}{.5141240} = \frac{2688}{.5141240} = 5228.31067 = 5228 \text{ (No suitable factors)} \quad (B \times D)$$

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$$\frac{(A \times C)}{.5141240} = \frac{46 \times 60}{.5141240} = \frac{2760}{.5141240} = (B \times D) = 5368.35471 = 5368 = 88 \times 61$$

$$\frac{(A \times C)}{.5141240} = \frac{48 \times 60}{.5141240} = \frac{2880}{.5141240} = (B \times D) = 5601.76144 = 5602 \text{ (No suitable factors)}$$

$$\frac{(A \times C)}{.5141240} = \frac{52 \times 56}{.5141240} = \frac{2912}{.5141240} = (B \times D) = 5664.00323 = 5664 = 59 \times 96$$

$$\frac{(A \times C)}{.5141240} = \frac{46 \times 66}{.5141240} = \frac{3036}{.5141240} = (B \times D) = 5905.19018 = 5905 \text{ (No suitable factors)}$$

$$\frac{(A \times C)}{.5141240} = \frac{32 \times 96}{.5141240} = \frac{3072}{.5141240} = (B \times D) = 5975.21220 = 5975 \text{ (No suitable factors)}$$

It is seen that just these seven sample solutions give three satisfactory gear combinations, the best of these three being 52/59 x 56/96, since only one additional gear is required, and since the error per inch of thread due to the change gear combination is only .000,000,567 inch.

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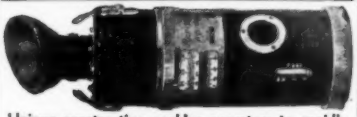

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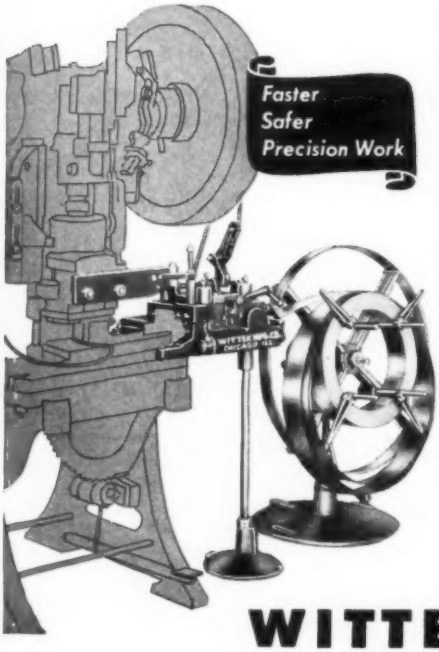

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"WAITING" TIME

By LEO J. ST. CLAIR*

THERE are various kinds of "waiting" time. You wait at the station for a train; you wait at the theatre for the show to begin; you wait patiently at Thanksgiving for that good Turkey Dinner; you wait at Christmas Time for Santa Claus to open up, etc.

These are not the kinds of "waiting" time that I want to gripe about. There is a type of waiting time that every one should gripe about, because it has to do with persons that are selfish, thoughtless, obnoxious, discourteous, dishonest, disagreeable, etc., and are a poor investment for any industrial firm to have around. And I mean the purchasing agent, the chief engineer, the tool engineer, the shop manager, the shop superintendent, etc., who cause people that are calling on them, to wait, wait, wait. Maybe this is their way to show the poor humans that have to call on them how very important they are, or maybe they just don't think—(period!)

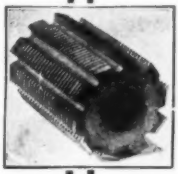
I will grant there are many times that any one of these officials mentioned, (and those not mentioned) are very busy with very important work at the moment the caller is announced, and they just simply cannot see or interview the caller immediately. However, this does not give them the privilege of being selfish, thoughtless, obnoxious, discourteous, dishonest, disagreeable, etc. Such a circumstance provides an opportunity of creating good will for the concern that pays them for what they do, and what they are supposed to do.

When a person cannot see a salesman, or any other person who has gone to a great deal of trouble and expense to get to his place of business, he should do one of two things:

1—He should tell the receptionist that it will be impossible to see Mr. So-and-So right away, but will be able to see him in 10 minutes or one hour or any other time interval. If the time that the caller must wait is too long, the man to be interviewed should ask the caller to make other visits in the neighborhood and come back at a definite time. If he cannot make good on his first time promise, he should request the receptionist to call his attention to this—and then make a second promise (But not too often).

2—If he cannot see the caller that day, he should say so. If he doesn't want to see the caller at all, he should

*President General Tool & Die Co.



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be frank enough and honest enough to tell him so—and why. Fabrications about being out of town, out playing golf, etc., are seldom convincing.

I had an experience recently that did my heart good. I had called on the plant manager of a large concern several times, always feeling that he should see me rather quickly because I was performing a real service for him and his concern. But invariably I cooled my heels and heated the seat one or two hours before he would grant me the fine favor of talking to him. Frankly, the last time I waited about three hours, and I will confess that the back of my lap was becoming numb, and my thoughts of him were anything but complimentary. When I finally got to see him, he asked if I could make arrangements for him to go and see a certain individual with whom I was particularly friendly, in order to put over a potentially big deal for his firm. I was willing to help him, and made the requested arrangement, going along with him to see this person, so as to smooth the way as much as possible. In the meantime, I asked my friend to make us wait at least three hours before we could see him.

We arrived at the plant at 9:00 A.M., bright and pert. At 9:15 A.M. my plant manager friend (he is not the manager of my plant) said to me: "Who the heck does Mr. So-and-So think he is?" At 9:30 A.M. he approached the receptionist very impressively, and asked her to remind Mr. So-and-So that Mr.—— and Mr. St. Clair were in the lobby waiting to see him. This she did, but nothing happened. At 9:45 A.M. he said to me:— "Doesn't Mr. So-and-So realize that I'm a very busy man?" I was in a "ribbing" frame of mind and remarked—"Of course he does, but he's probably busy too. You shouldn't mind this too much. It's just a matter of getting used to it. I often wait one, two or three hours very patiently to see **important** men." (Mental correction please, to see, selfish, thoughtless, obnoxious, discourteous, dishonest, disagreeable, etc., **important** men).

By 10:15 A.M., my plant manager was beginning to pass his right hand thru

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Space between frame head and top of table, adjustment down 3¾".

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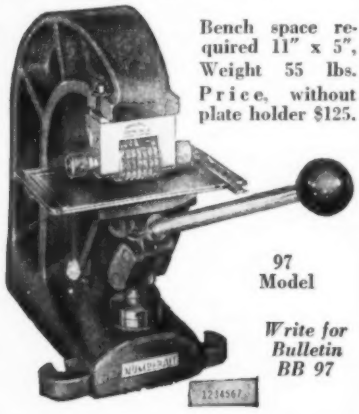

Bench space required 11" x 5", Weight 55 lbs. Price, without plate holder $125.

97 Model

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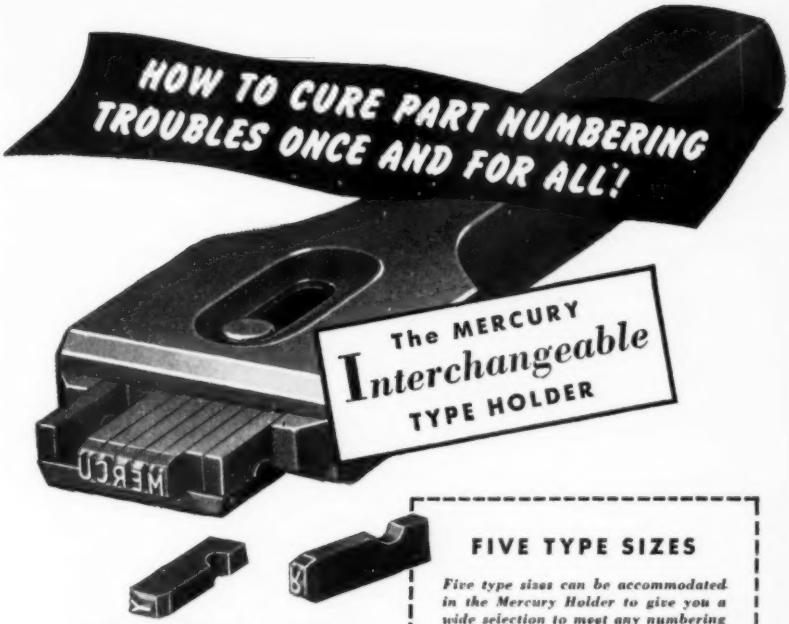
his hair, messing it up. He remarked to me: "How do you stand this so calmly? Doesn't it get your goat?" I countered with "Oh, not so much, it's just a matter of getting used to it. This gives me a chance to catch up on reading the trade publications. There's plenty of reading matter in most places, so I try to make my waiting time as profitable as possible." Then my plant manager took the hint and went over to the table profusely packed with industrial reading matter, and picked up a six months' old magazine. He tried reading, but gave up in about five minutes. "Why don't they supply stuff that's up to date?" He then attempted to clean his fingernails, and seemed on the way to enjoy his waiting time. Since his hands were in fairly good shape, the manicure job did not take too long and my plant manager got up and paced up and down, casting frowns at the receptionist.

At 10:45 A.M. he, not so impressively, asked the receptionist again to remind Mr. So-and-So, that both of us were waiting to see him. The answer was: "Tell Mr. St. Clair and Mr. So-and-So that I don't know just when I can see them, but I will see them. Tell them to wait." He glared at the receptionist and barked: "What have we been doing for the past hour-and-a-half?" She made him feel much better by expressing her abject sorrow and sympathy. (She was in on the play, too).

The next hour-and-a-half brought out many traits in my plant manager that I had never suspected. At about 12:00 o'clock he asked me if I were any relation to Job. I merely reminded him that the last time I called on him that I had waited for three hours, but I had caught up on a lot of reading. He trumped my Ace with a feeble—"I think this is awful. What can your friend be thinking of." I prophesied that he would, no doubt, be hearing from him in a few minutes, for it was close to lunch time. We did. My friend, inside his comfortable office, asked the receptionist to tell us that he was so sorry please. He just had to go out to lunch with the president of the concern, and that he would be back at 1:30 P.M. but

HOW TO CURE PART NUMBERING TROUBLES ONCE AND FOR ALL!



METAL PARTS, tools and equipment that require identifying letters or figures can be quickly, neatly and accurately stamped with this Mercury Type Holder. It eliminates a dozen part numbering problems encountered with single-character stamps, including such costly errors as wrong sequence, damaged parts and illegible numbers — *because it is fool-proof!*

The Mercury holds the entire part number — as many as 20 characters, if needed. Each character is held in rigid alignment, and is so constructed that it cannot be placed in the holder upside down. Simply snapping the type in place in the holder locks the type, ready for stamping. Then, placing the type on the part and striking the anvil with a hammer stamps the full part number. *It's fast, accurate and easy!*

FIVE TYPE SIZES

Five type sizes can be accommodated in the Mercury Holder to give you a wide selection to meet any numbering need. With a single holder and various type sizes, you're ready for almost any numbering job. The Mercury Holder is compact to permit numbering small parts . . . is of all-steel machined construction . . . has just four simple parts. Hardened and ground hand-cut steel type is available in a complete range of sizes.

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IMMEDIATE DELIVERY

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to be sure and come back at that time, and he would be "Johnny on the Spot".

We then went out to lunch. According to my plant manager, "the food was punk, the waiters terrible, the weather humid, etc." In short, life for him had become quite a burden, and all over a little waiting time of a mere three hours. After listening to a lot of "beefing", I reminded him that we must be back at Such-and-Such a plant, to see Mr. So-and-So, at exactly 1:30 P.M. We were prompt. But our important person that we were calling on was not. —The receptionist's call to his office drew a blank—"Not back from lunch yet." His secretary said she would inform us the moment he got back. An occasional wink from the receptionist kept me in good spirits, and this seemed to make matters worse. My plant manager's torture was over at 2:10 P.M.

We were escorted to my friend's office—(sumptuous, it was. Large chairs with Air Foam Cushions, etc.) "I'm sorry I kept you waiting. Won't you sit down." "Oh, that's quite all right" my plant manager said. Now you know he wasn't telling the truth.

Fortunately his visit proved to be very profitable. It isn't always so, even after long, long waits. Will you callers or peddlers agree on this? That just makes any day—very pleasant. Period!

On the way back to his plant, this plant manager remarked "You know, St. Clair, I never realized what it was, to wait for someone so darn long. When I come to think of it, I make people wait too. Now I can see it isn't right and I'm going to do something about it. I know this sort of thing happens with a lot of our executives. What a fine impression we must make on persons, kind enough to call on us, and hand us all sorts of things on a silver platter. Got to do something about it."

The next time I visited this man's plant, I couldn't believe my eyes. There was a huge placard affixed to the wall and in huge letters was this humble confession:

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The Northern 20 Ton motor driven Hydraulic Press is a self-contained, completely portable unit. Pressure selection from 1 to 20 tons easily made by a turn of the Pressure Regulator screw. Massive arch design eliminates side thrust, distortion or cramping action. Fast (90" per min.) power stroke automatically changes to slow speed under load. Retracting stroke is 120" per min. to reduce idle period to minimum.

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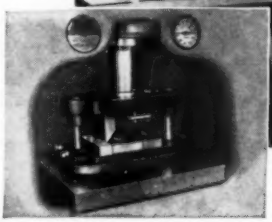

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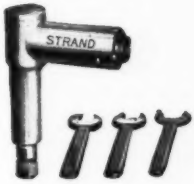

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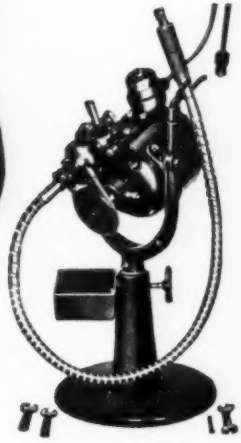

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"We haven't always been courteous to those who called on us. **Henceforth, we will be.** Every executive in this plant has been instructed to accurately inform our receptionist how soon he can see you. A time promise must be made if he cannot see the man calling right away. If this promise is not met, the receptionist is now ordered to call him back to find out the reason for delay. If a second promise must be made, **we consider this a breach of good judgment on his part.**

"Our receptionist has been ordered to keep a record of every broken first promise. I have made it clear to everyone concerned in this plant that such action is **very undesirable** and will be considered as such.

"We want to prove to you who call on us, that we consider your time just as valuable as ours, by seeing you **just as soon as it is humanly possible to do so.**"

Mr. So-and-So—Plant Manager

Amen, I say to you—"Can this be possible." These words made me feel good, but did they mean what they said. I announced myself to the receptionist. A few seconds later I was being led to the plant manager's office.

I will always be grateful to this man. He has performed a real service for his company. I have already heard several very favorable comments from various peddlers, who call on various persons at this plant. I will grant that this is like the Oasis in the Desert, but why shouldn't it be general practice. It is one of the easiest ways I know of spreading GOOD WILL.

Don't wait to do the right thing, henceforth, along these lines. Promise yourself to do it RIGHT NOW. Any conscientious and honest man, will make such a promise and follow thru.

If such a change took place in all plants thruout the country, I have cal-

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culated that the time saved at an average rate of $2.00 per hour (and this is a low figure when one considers the average caller's salary and expenses) multiplied by the time saved over a year, would almost pay the present National Debt—Quod Erat Demonstratum—or to you, who, in the past, may have caused such anguish in the hearts of salesmen, this Latin quotation means "It has been proven." (Period!)

I am planning to get some reprints of this article. Anybody that makes a reasonable request for these, will receive a supply. I suggest their use in this manner—if a person has made you wait too long—on your way out, leave a copy for the guilty person to read.

CINCINNATI ARBOR CATALOG

Cincinnati Milling & Grinding Machines, Inc., Cincinnati 9, O., has issued a new edition of its arbor catalog, publication M-1424. This new catalog is intended to be much more convenient and complete for users of milling machine accessories. Improvements include complete lists of arbor collars, drawings and dimensions of arbor support bushings, spring chucks and collets, and dimensional drawings of Nos. 40, 50 and 60 series taper shanks. Most of the data are given in tabular form for convenient reference.

BALL BEARING HANDBOOKS

New Departure offers another new book in its series of treatises for designers, on the fundamentals of ball bearings—entitled, "Bearing Application."

With 78 drawings and charts and a clear and orderly description, the book covers among other subjects the most important fundamentals of bearing mounting applicable to all types; preloading methods, their effect on housing fits, the effect of press fits on preloading, the effect of preloading on bearing life; bearing creep, the use of duplex, shield and sealed bearings, etc.

Copies may be obtained free from the Advertising Department of New Departure, Division of General Motors Corp., Bristol, Conn., by specifying booklet BA.

A companion book entitled, "Details of Design," issued last year and covering the details of shaft and housing design for ball bearings will also be supplied to those who have not already received a copy.

BALLS IN DESIGN

By JOHN E. HYLER

IT is interesting to observe the many practical uses that balls have found in machine and equipment design. In the case of a certain flexible coupling, designed not only to compensate for misalignment, but also to absorb shocks incidental to starting, rubber balls were employed, being set into pockets in a flange. The driving force is exerted directly against these rubber balls, which are in compression, whichever way the coupling is driven.

Balls for ball bearings are actually the most important balls to be found, as far as their overall influence on industry is concerned, but we have become so used to them that in many cases they are not given the thought and consideration they deserve. Think of what would happen to mechanized industry if ball bearings were taken from us, and we will then give them proper appreciation.

Possibly you have noticed the material handling devices known as ball transfers. In these, balls are provided in mountings so that they will roll when material is moved over them. Such balls may be mounted on table tops or any flat surfaces, or they may be mounted on top of pipe-type standards. The latter arrangement allows sheet materials to be handled at convenient working levels, and at the same time, workmen can walk around between the standards. They are convenient for handling heavy sheets at the shears, bending rolls and like locations.

It is sometimes possible to derive the unusual and useful motion from ball-and-socket types of mechanisms. In the case of a popular line of mechanical lubricators, the pumping elements are actuated by horizontally-mounted small shafts, which have combined sliding and rocking motions. The sliding and rocking motion is imparted to the shafts by means of ball-pointed studs, the balls on the ends of the studs engaging holes drilled in discs, the discs being mounted on the ends of the power input shafts, located at right angles. Really this is a very remarkable device, and is an outstanding instance of the versatility of ball and socket joints. Such lubricators are used on a great many different types of machinery.

I once encountered a special collet which could be used for driving broken straight-shank drills, there being two hardened steel balls inserted from the exterior, which were allowed to extend into the collet interior sufficiently to engage and hold in the drill flutes. Balls have, of course, been used for various clamping and driving mechanisms, as well as for various detents.

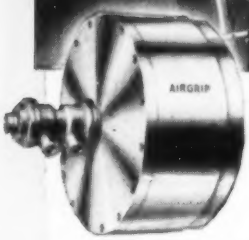
A trick worth knowing in the case of large nuts that are given to seizing on their mountings, involves the use of a ball thrust bearing, slipped onto the bolt, shaft or other device just ahead of the nut. It is a trick that has been found useful in connection with various machine arbors where trouble with seizing has been experienced. By slipping the thrust bearing into place ahead of the nut, the nut comes down tight with a rolling contact, and will loosen in the same way when required.

CINCINNATI ENGINEERING DATA

A supplement to the popular Cincinnati "Engineering Data" catalog (publication M-1418) was recently printed for methods, tool, and plant engineers, in an effort to keep them up to date on our new products.

In an effort to continue this service to engineers, the next issue of "Engineering Data" will include the supplement, plus any new Cincinnati Milling Machines which might be completed in the interim.

The supplement comprises 24 pages and embraces Milling Machines, Broaching and Cutter Sharpening Machines, with detail drawings and specifications. Copies are available from Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, O.



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BROACHING CLUTCH DISCS

AUTOMATIC broaching setups using relatively simple broaches can be designed to broach complex parts and effect substantial savings in production costs. In a typical operation, involute internal teeth are automatically broached on heavy duty clutch discs. Altho total volume for each disc size is not so great, six different sizes of discs can be handled on this same broaching machine using the same fixture, simply by changing the adapter rings in the fixture. This installation was designed and engineered for a manufacturer of agricultural equipment by Colonial Broach Co., Detroit.

The clutch discs shown in Fig. 1 are of mild steel and are 14" inside diameter. Inasmuch as each disc is approximately 0.115" thick, the stack of 13 pieces, worked simultaneously, is about 1½" high.

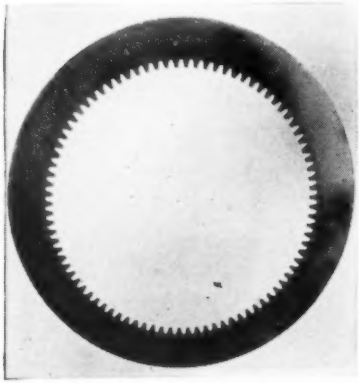

Fig. 1—The 120 involute internal teeth around the inside diameter of this heavy duty clutch disk are finish machined in 12 strokes of the broach. Thirteen disks are placed in a 1½" high stack and 10 teeth are broached at a time.

TOOLING—The broach which cuts the 120 teeth, 10 at a time, around the inside diameter is in six sections. Each individual section can be replaced separately if needed. Total broach length is 66" and length of stroke is 72". A single stroke of the broach ram produces the full tooth depth as the broach is designed with sections which rough, semi-finish, and finish the tooth contours at one stroke.

Broach sections—all of them 4" wide—are attached to the broach bar by a tongue which fits into a groove in the bar. The sections are locked in place from the back side with screws. Minimum deflection of the bar—which is 5" wide, 3" thick and quite strong—is assured by the close fitting guides placed both above and below the work. The broach bars enters guides below the work where the cut begins, providing maximum tool support and preventing "chatter".

MACHINE—The clutch disc teeth are cut by pushing the bar carrying the broaches down past the work. The power press employed for this work is rated at 15 tons capacity.

FIXTURE—The rings are stacked in the sliding fixture when the fixture is in the extended position shown in Fig. 2. Work is held securely in the fixture by four dogs which are clamped down by hand.

CONTROLS—Automatic work cycle is started by pushing the "start" button, the second from the top in the "control" group at the right, Fig. 2. The top button at the right and button on the left column are "stop" buttons. Third from top at right is a selector switch for automatic or hand operation. Fourth, fifth, sixth, and seventh buttons are "inching" controls, one each for moving "fixture in"; "fixture out"; "ram down"; and "ram up". These inching buttons

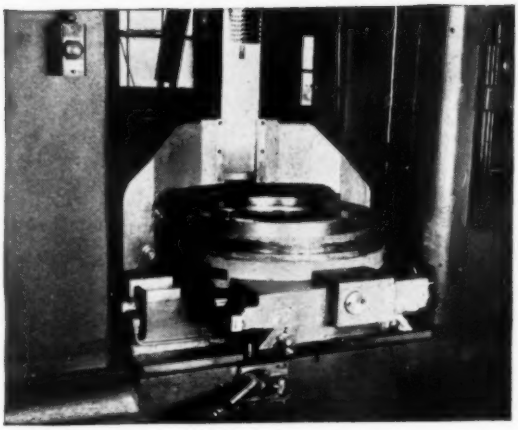

Fig. 2—A closeup view of the shuttle-type fixture for holding the clutch disks. Fixture was designed by Colonial Broach Co. This view also shows part of the heavy broach bar and massive guide framework.

are used only in initial tryout and checking the setup.

OPERATION—After the operator has loaded the fixture and pushed the "start" button, the machine automatically moves the fixture to working position and controls movement of fixture, work and ram to make a series of cuts. Then it returns the fixture to the unloading position and stops. The complete sequence is:—

—Operator places work in fixture; tightens clamps.
—Operator pushes "start" button.
—Automatic cycle controls take over operation, and
—move fixture into working position;
—move ram carrying broach down past work, cutting first 10 teeth;
—move fixture so work clears broach.
—Broach moves up to original position.
—Fixture moves further back and
—indexing for next group of 10 teeth takes place, as
—fixture moves up to cutting position.
—Ram then descends; broach cuts next set of 10 teeth.

This cycle continues until 120 teeth have been cut at the 12 different cutting positions.

—Upon completion of the last cut, the fixture moves forward for unloading and the machine stops.

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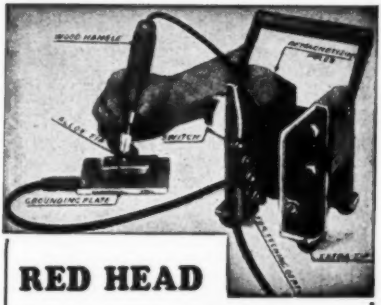

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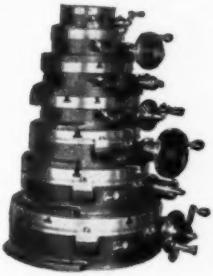

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OUTPUT—A significant factor is that this broaching setup provides greatly increased production as well as reduced costs. When using internal shaping tools to cut these teeth in the clutch discs, it required from 45 minutes to one hour to complete one disc load. Now, 10 to 12 disc loads are produced per hour. Since each set contains 13 individual discs, this is an output of 130-156 pieces per hour from one machine. Counting 12 sets per hour, this is a production time of five minutes a set, which includes unloading and reloading time as well as time required for the machine to go thru its automatic cycle.

C. Bedell Monro, left, President of the Pennsylvania-Central Airlines, and Glenn L. Martin, President of the aircraft company which bears his name, examine a model of the new Martin luxury airliner, Model 202. The PCA organization recently announced an order for 35 of the 40-passenger twin-engine planes, a contract representing $7,000,000. Mr. Monro stated that this was only an initial contract and that in the Martin Model 202 he saw an aircraft which would curtail ground time, reduce maintenance and operating costs, offer new passenger comforts and safety and ultimately pave the way for lower fares.

Welding Automatic Boilers

ONE of the major reasons why the latest process of automatic metallic shielded arc welding has made such strong inroads in the field of pressure vessel fabrication, has been the ease with which the method may be adapted to the manufacture of various sized tanks and boiler structures.

A typical installation of "Lincolnweld", the automatic welding process developed by The Lincoln Electric Co., Cleveland, O., is that in operation at C. H. Dutton Co., Kalamazoo, Mich. Here, steam boilers ranging from 16 to 60" in diameter, with working pressures of from 50 to 150 pounds, are weld-assembled on a production basis at high fabricating speeds and with marked economy and quality of the finished product over the former riveted design.

The welding head, flux hopper and controls of the "Lincolnweld" are mounted on a special fixture where it can be adjusted to the desired position over the work. This general arrangement can be seen in Fig. 1. The 1200 ampere motor generator is located at the right.

In automatically welding the circumferential seams, the work is rotated on the roller supports of the fixture, and for longitudinal welding, the entire fixture is made to travel at a pre-arranged speed along the tracks on which the entire assembly is mounted. The drive is governed by the speed reducer shown.

Boiler plate sections are joined at the double V butt joints by first applying a hand weld on the inside of the seam with A.W.S. shielded arc electrode E-6010. The automatic weld is then deposited with the metallic arc process in a single pass on plate thicknesses ranging up to 7/16". A cross-sectional view of this joint is seen in Fig. 2.

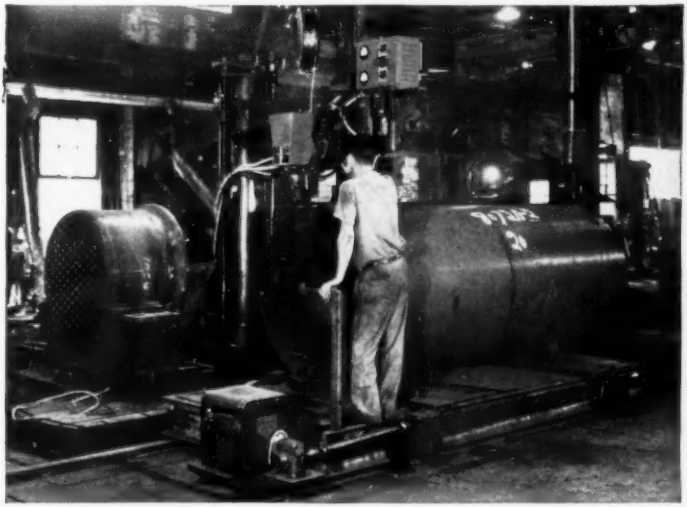

Fig. 1—"Lincolnweld" unit in operation in welding longitudinal boiler seam. Work fixture travels with speed reducer drive seen in foreground. Note deposition of flux along seam at top of boiler. This flux completely shields arc and protects molten weld metal while it cools.

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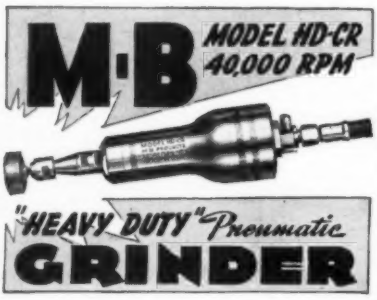

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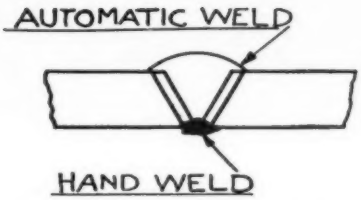


Fig. 2—Cross-sectional view of typical "Lincolnwelded" joint in fabrication of boilers.

In fabrication of the fire box a double V joint is also used for the circumferential seam with finish automatic welds being made after first manually welding on the inside to provide a back-up bead for the outside automatic weld. The comparatively short longitudinal joint for this assembly is hand welded with A.W.S. E-6010 electrode.

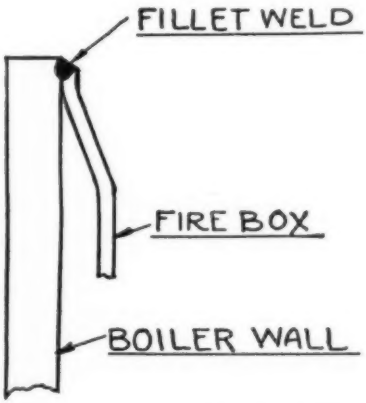
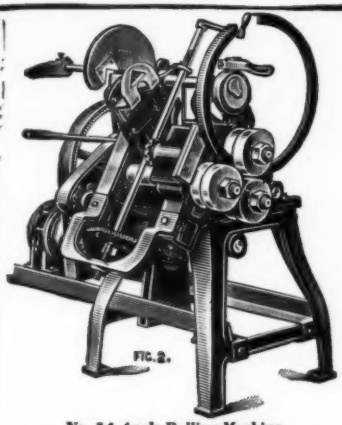


Fig. 3—Cross-sectional view of fire box-to-boiler wall fillet joint for welding.

Final assembly of the boiler consists of fitting the fire box inside the shell, thus forming a joint with the shell side wall as shown in Fig. 3. In making this circumferential fillet weld, manual methods have been used but the "Lincolnweld" process will later be adopted to fuse this joint also, conforming to the required ASME code, U-68.



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YOUR TAX PROBLEMS

THE INFLATION BOGEY

By ARTHUR ROBERTS

THE Revenue Act of 1945 repealing the excess profits tax and reducing individual income taxes should be a boon to business in 1946 when the reduction becomes effective. Moreover, some economists state that this reduction is inflationary, and that the government should keep siphoning back a large part of the national income. This argument would wear better if the government froze the "take" but inasmuch as the taxes levied will be spent in one way or another by government agencies, it would seem that inflation would be just as much a threat regardless of the tax levy. Even if the deficit were reduced by taxes, it would be largely a switch-over from governmental indebtedness to potential purchasers or investors, which would add to the existing stockpile of money.

Our economy is largely a matter of give and take—taking from one and giving to another. Consequently, as long as the money is brought into being, it remains somewhere in the system and if the sum-total is far in excess of available goods, inflation is a possibility.

I believe that all-out production will put a damper on inflation more effectively than the maintenance of top-flight taxation. Supply and demand is the one law of traditional economics that will stand as long as human nature is what it is. Recently, the government bought potatoes at support prices, turning them over "for free" to dairy farmers for livestock feed—good grade spuds. Because of the huge surplus this year, millions of pounds were bought up to prevent a collapse in the market, these purchases effected to

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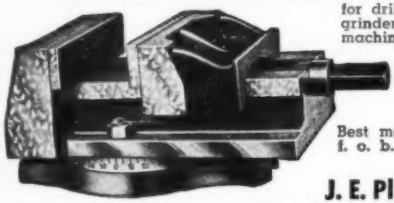

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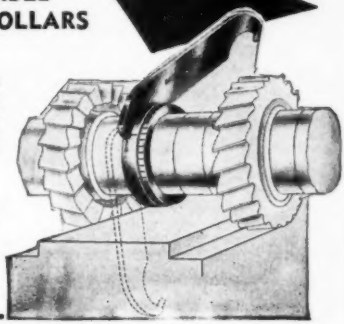

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withdraw sufficient quantities from the regular market to prevent panic prices and spoilage. Only a few years ago, potatoes were at a premium when there was less buying power than now, yet, today, with all the inflationary talk—with buying power at a peak never before known in our history, the government must buy up potatoes to prevent distress selling.

The same would hold true in connection with radios or darning needles and we have the productive capacity to turn out tremendous quantities of all kinds of things. Reports are current that the Department of Agriculture expects farm income to drop 15 per cent in 1946 due to a decrease in the price of farm produce. This doesn't sound inflationary and would indicate that taxes should be reduced further in the coming year to give the farmers more spending money if we are to keep employment at tops.

High taxation, in addition to decreasing the buying power of farmers and others whose incomes will be reduced in 1946, will retard the production needed to combat inflation. Businessmen in the top brackets will not be inclined to strive for all-out production if the government gets too much of the net profit. This was indicated by the apparent selling strike in some quarters at the end of 1945. Businessmen badly in need of goods reported that they could not get shipments until 1946. The orders were booked but not shipped altho goods were on hand. It was the general opinion that shippers were waiting until the excess profits tax was off in 1946 so they could earn far more on the orders than if shipped in 1945.

Incidentally, our productive capacity has been greatly increased during the war. We can turn out more production than ever before if we go to it. During prewar depression days, one complaint was frequently voiced that we could make more goods in four months than consumers could consume or use in a

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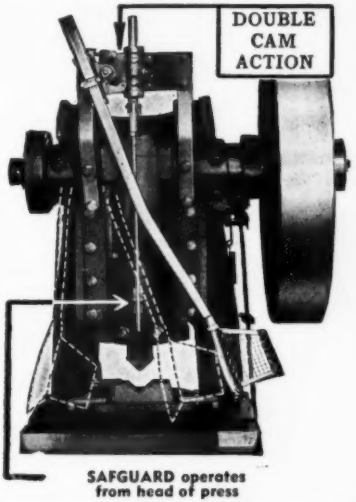

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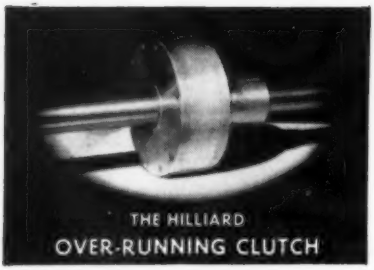

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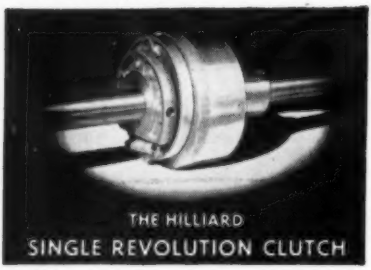

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year and this was given as the reason for unemployment. You don't hear that any more. However, the fact that there is more folding money in banks and pocketbooks doesn't negate that condition. We have even greater capacity today to supply consumer demand in this country than in prewar days and this should stymie disastrous inflation. Labor-management quarrels, however, can be inflationary if they retard production. In this regard, the machine tool user can do his bit to stop inflation by getting tops in production and effecting favorable relations with labor insofar as conditions permit.

Inflation in European countries is often dragged into the discussion to focus attention on the dire consequences of this monetary eruption. A wheel barrow full of marks for a loaf of bread in Germany after the last war is recalled to mind by those who forecast inflation in this country. However, Germany was woefully short on goods after the first war, probably worse than today, so naturally, at such a time, money becomes as cheap as sand on Sahara. I think it is unfair to compare our economy with any European country, even England, and this is too often done. Even at this writing, goods are plentiful here, far more plentiful than anywhere else on Earth. Moreover, Washington seems to feel that from six to eight millions will be unemployed next spring and this would appear to be deflationary rather than an upward spiral. Also note that the figure on unemployment is set between six and eight millions, a differential of two millions or about 30 per cent. This betokens the degree of accuracy with which the government can predict employment should full employment legislation be put into operation. A "guestimate" that is 25 to 35 per cent wrong would prove very costly and eventually such estimates could cause more havoc than occasional unemployment. This is worth a thought.

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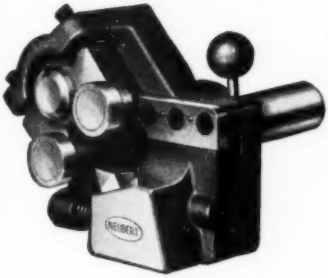

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Describing the
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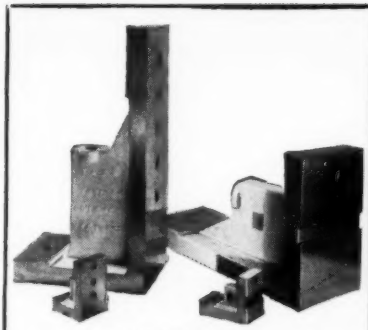
Compared to prewar days, we have inflation now. Check the prices of much you buy, with prices for the same or similar goods before the war and this is apparent. Moreover, the quality of salables has been greatly reduced which is invisible inflation. There is a possibility if industry can get going full blast in 1946 that prices on some lines will decrease. Consider the potatoes. Also turkeys. In the East, they were offered at under-ceiling prices because the market was glutted. Price control and other restrictions may stymie production, likewise, labor-management strife, and this may lead to inflation, which topflight taxation cannot prevent even if the government buried the revenue in a hole instead of throwing it on the monetary stockpile.

In my opinion, the Revenue Act of 1945 is a deterrent to inflation and if we can have less government spending that will help still more. Government controls, labor-management quarrels and curtailed production are inflationary, likewise, wartime taxation in peacetime. The latter has been considerably modified; hence, the inflationary threat modified, and other factors are a "guestimate" at this writing. If solved satisfactorily, we shall not have unbridled inflation altho it is accepted that labor and other business costs will be higher in the postwar period than in prewar days, hence, prices are likely to be on a higher level.

Inflation has an ominous sound and it may be used as an excuse for not pruning taxes too sharply, altho I have noticed of late, more emphasis is placed upon the fact that heavy government expenditures after the war, (probably $25 billions annually against $10 billions in prewar 1939, including $10 billions for veterans aid and care and national defense,) will keep taxes extremely high in the postwar period. The best bet for lower taxation lies in cutting government expenses to the bone after the war and every machine



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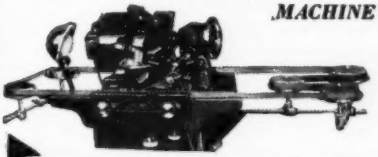

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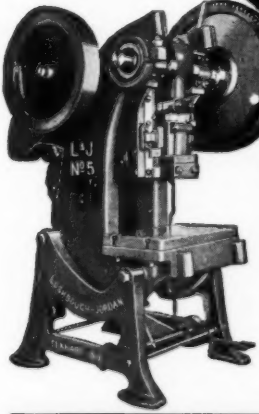

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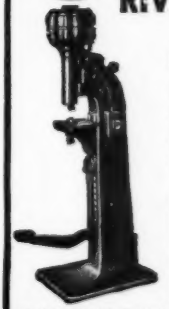

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tool user should do his bit to acquaint his representatives with this essential to business management.

It is also possible that revamping of the present hit-or-miss tax laws will effect some beneficial results. Much has been said about this, but so far, nothing has come of it. One tax expert contends that it would take 25 years to simplify the tax laws. It can be done in a year if the pruning is sharp and the government would lose no revenue. In fact, something must be done to simplify the income tax laws if the government is to get maximum revenue. Due to the over-lapping and garbled phraseology of the Code, the government doesn't know whether it is collecting all it should get and the taxpayer doesn't know whether he is paying too much or too little, a situation that does not beget maximum revenue to the Treasury Department, fair treatment for the taxpayer or safe conduct for business. Simplification of tax laws would save thousands of manhours for taxpayers in preparing returns and reduce personnel in the Revenue Department, which is one way to cut expenses. Also, it would also give all taxpayers a cleancut idea of what expansion and other business ventures would cost them. Today, many fear to venture in business because of high taxes and the inconsistent content of the Code, a detriment to incentive and full employment.

INTERNAL GEAR FINISHING

The improved Model 860-C internal gear finishing machine which operates on the established "Michigan" crossed-axis gear shaving principle, is described and illustrated in a new technical bulletin No. 860-C-45, now available from Michigan Tool Co., 7171 E. McNichols Road, Detroit 12. The 860-C—designed to finish shave internal spur and helical gears accurately and to maintain that accuracy longer—has a maximum swing of 12". It will handle gear blanks up to 12" maximum OD down to a minimum of 4" Pitch Diameter.

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COLOR IS A SCIENCE

By E. D. PECK*

MODERN industry has reached many times into the past for some of the more amazing mechanical contrivances and processes which helped to speed production of war goods. The basic laws of science, mechanics, and mathematics which great men from all ages have discovered and formulized serve as guideposts for modern living. While such men of science as Euclid, Kepler, Huygens, Gallileo and others concentrated their activities on highly technical and abstruse incursions into the realm of pure science, many of them found time to develop mechanical contrivances or processes which have ultra-modern application.

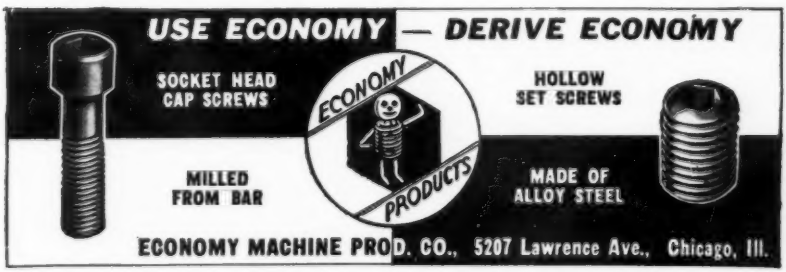
Archimedes for example is best remembered by his contributions to mechanics and hydrostatics but he was also an inventor of war machines of great value, counterparts of which have been used in our time. The name of James Watt connotes development of the steam engine, but how many people know that he also made a machine which is the direct fore-runner of one of the most highly specialized machine tools now being used in war plants. Michael Faraday's name is almost synonymous with electricity and yet he would have achieved fame for his chemical experiments in liquefying chlorine gas. While every high school student is familiar with Louis Pasteur's work with rabies, they will realize that he was the savior of the chicken and cattle business—a contribution which assumes almost infinite proportions in relation to today's menus.

NEWTON FATHERED COLOR ENGINEERING

When the name of Isaac Newton is mentioned many people conjure the picture of this eminent scientist sitting under an apple tree watching the fruit fall earthward and from such occupation proceed to discover the law of gravity and eventually the natural inter-relation of the component parts of the Universe. Others remember Newton from their physics classes as an experimenter and discoverer of certain theories of light. Few people recognize the fact that Newton is the father of the increasingly important science of color engineering that is harnessing the potent force of color for more efficient and enjoyable living.

Almost 300 years ago, Newton in trying to correct some errors in glasses

*General Paint Manager, Pittsburgh Plate Glass Co.



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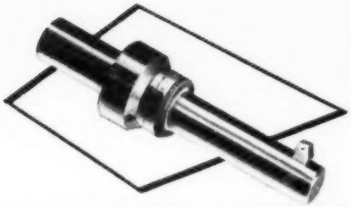
he was using to fashion a telescope, was experimenting with optical glasses. One day he took a prism to "try therewith the celebrated Phaenomena of Colours." As the sunlight streamed into his darkened room thru a hole in the shutter, Newton placed the prism in the path of the sunlight so as to refract it to the opposite wall. According to Newton's own account of this, he was very pleased with the many beautiful colors. However, after studying the colors for a while he became aware that these sizes, shapes, and forms did not conform to the then commonly accepted theory of color.

NEW PHENOMENA SEEN

As he stated in his Philosophical Transactions—"I became surprised to see them in oblong form; which according to the receiv'd laws of refraction, I expected should have been circular." Neglecting his work with the telescope for the moment, Newton pursued the study of this color phenomena and other findings attendant upon his discovery of the spectrum. His conclusions on the nature of light and color were "in my judgement, the oddest, if not most considerable detection which has hitherto been made in the operations of nature."

THE FAMOUS EXPERIMENT

To prove that his conclusions were correct he performed his famous "Experimentum Crucis." This epochal undertaking is best described in his own words—"I took two boards and placed one of them close behind the Prism at the Window, so that the Light might pass thru a small hole, made in it for the purpose, and fall on the other Board, which I placed about 12 feet distance, having first made a small hole in it also for some of the incident Light to pass thru. Then I placed another Prism behind the second Board, so that the Light trajected thru both the Boards might pass thru that also, and be again refracted before it arrived at the wall. This done, I took the first prism in my Hand, and turned it to and fro slowly about its Axis, so much as to make the several parts of the Image, cast on the



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There's no try-try-again when you use the Dialset tool. One preliminary cut shows you how to set the dial for enlarging or reducing the bore to the exact diameter wanted. Each graduation on the scale means a change of .0005"; full adjustment, .025".

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second Board, successively pass thru the Hole in it, that I might observe to what Places on the Wall the second Prism would refract them."

From this experiment Newton proved that white light is of a compound nature, and that it is composed of all colors. By first directing the rays of the white light of the sun thru a prism to cast a spectrum and then again refracting the rays thru another prism, he again produced white light. Newton summed up his color discoveries by stating that "Colors are not qualifications of light derived from refractions of natural bodies, as is generally believed, but original and connate properties which in divers rays are divers . . . to the same degree of refrangibility ever belongs the same color and to the same color ever belongs the same degree of refrangibility."

SELECTIVE REFLECTION ESTABLISHED

Newton's experiments following discovery of the true nature of light and color were so exhaustive that he pretty much covered the entire field. He made some minor errors which have been corrected, but in the main he has given the world its knowledge of color. From him, for example, we know that the color of practically all objects we look at is obtained by the selective reflection. That is when light strikes an object, only certain colors are reflected and others are absorbed. "Colours in the object," said Newton, "are nothing but a disposition to reflect this or that sort of Rays more copiously than the rest."

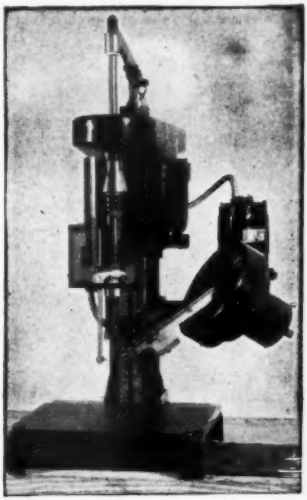
While Newton's color discoveries gave rise to widespread mathematical and philosophical discussions in the following years, little or no practical application of his findings were made until nearly 130 years after his "Experimentum Crucis." This was largely because Newton, his contemporaries, or immediate followers did not recognize or understand the natural relation of color and wave-lengths and that it could be measured and used. Just be-

No. 2 To No. 6

Screws Driven on this Husky but Sensitive Hopper Feed Screwdriver.

No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.



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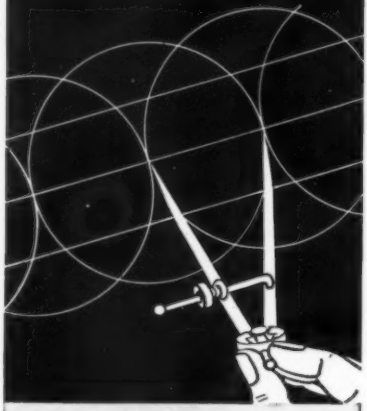

IN (12) COLORS:

136-Red . . 134-Blue . . 103-Green
104-Black..141-Cerise..137-Violet
138-Tangerine . . 139-Chartreuse
*142-Purple . . 140-Aquamarine
121-Brown . . 101-Yellow
*Shipped unless otherwise specified.

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fore the turn of the nineteenth century, Sir Thomas Young, of the Rosetta Stone fame, discovered that colors of Newton's spectrum moved in definite wavelengths. By proving that the waves of red light were longer than those of violet, he opened the doors for later discovery of the ultra-violet (by Edmond Becquerel in 1842), infra-red (Sir William Herschel in 1800), x-rays (Professor Roentgen in 1890), and other findings of spectroscopy which have contributed so much to modern living in the last few decades.

INVISIBLE RAYS USED FIRST

It seems strange that the first practical use of the knowledge of light and color were devoted to those rays and wave-lengths invisible to the naked eye. The physical and physiological uses of X-rays, ultra-violet, and infra-red preceeded adaptation of knowledge of the colors of the visible spectrum to practical formulas to assist mankind. It was in 1936, approximately 280 years after Newton's first discovery of the visible spectrum, that research technicians first used color as a specific. That is, they reduced the measurable characteristics of color to a given formula so that certain prescribed effects could be obtained. Much of the knowledge utilized in these first attempts at using visible color as an actual tool was derived from nearly three centuries of activity in the field. Yet such use presented many complex problems which the color engineers had to solve before it could be compacted into a practical, applicable form.

The first use of color as a specific was in hospitals where the system of painting various rooms to assist patients in their convalescent stages became known as Color Therapy. The success of color use prompted further research into possible color use in industry and other fields. Color engineers, following the advice of Newton that "the science of colors becomes a speculation as truly mathematical as any other part of optics," ultimately formulated the Principles of Color Dynamics by which the inherent power and energy of color

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DRILL, TAP, AND REAMER BREAKAGE with BUFFALO TORQUE CONTROL COUPLINGS

Machine Tool Type Utility Model

Based on the fact that torque and inertia are the fundamental principles of all drilling, reaming and tapping operations, the BUFFALO TORQUE CONTROL COUPLINGS are designed to eliminate drill, tap and reamer breakage by acting as a safeguard between the driving power and the tool.

When adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when over-loaded, thereby severing the driving power thru the coupling itself, but automatically re-engage and re-assume the driving power when the overload has been removed.

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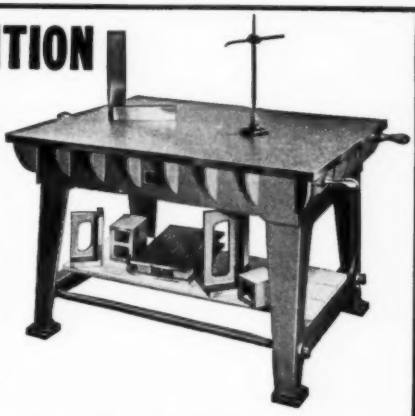

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

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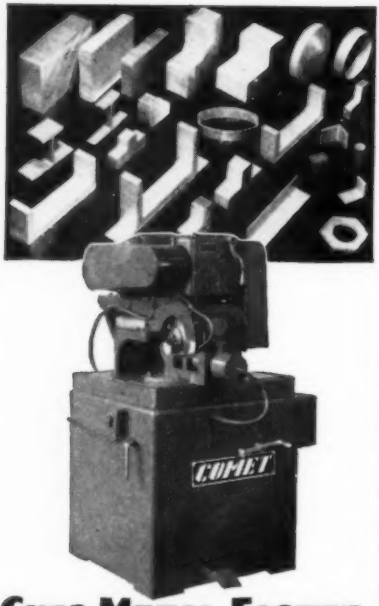

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MODEL MH

can be made to achieve certain predetermined physical results.

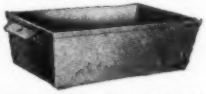
COLOR IS A VITAL FORCE

The practical results obtained with application of color according to scientific formulas of the Principles of Color Dynamics were readily apparent in wartime industry. In hundreds of plants the energy of color was being used to promote efficiency and establish improved employer-employee relations. The use of color as a specific instrument is in its infancy and promises to be one of the more important considerations in charting the course of human relations in the future. Color can be seen and appreciated almost everywhere, and like the other phenomena of nature, its efficiency and beauty will be used increasingly to improve our way of life.

HEAT TREAT FURNACE CATALOG

A new "40th Anniversary Catalog" of "Certain Curtain" Controlled-atmosphere Electric Heat-treating Furnaces is announced by C. I. Hayes, Inc., 75 Baker St., Providence 5, R. I. Described are furnaces for hardening high-speed steel and carbon, alloy and stainless steel tools and dies; annealing, copper brazing, tungsten carbide tool tip brazing; sintering metal powders, conveyor hardening, annealing and brazing; vertical heat treating, tempering and melting; also auxiliary atmosphere generating and recirculating equipment. Included is a section devoted to furnace atmosphere control, containing recommended atmospheres for a wide variety of standard brands of steel, together with manometer tables for obtaining desired atmospheres with various types of gas.

New Nesting Type Tote Pans



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

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Let's Talk Shop

GOOD GRINDING AND HONING METHODS SPEED PRODUCTION

By PAUL H. KRUPP*

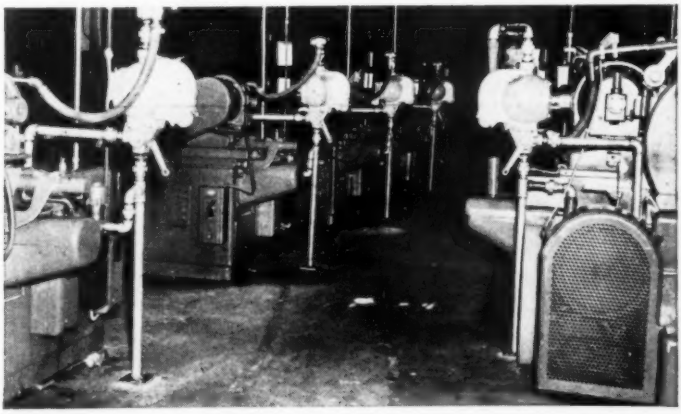
IN the metal working industry, the matter of getting better finishes from grinding and honing operations has always been of considerable interest. The subject has been of interest to worker and employer alike.

Workers have had a keen interest in better grinding and honing operations, because of their desire to turn out more quality work per day with less rejects. When workers can do that, management is naturally interested in how it is done, and, in the decreased operating costs which usually go hand-in-hand with a reduction in rejects.

Now, while reconversion to peace-time operations is under way, it seems a good time to review the subject of obtaining better grinding and honing finishes. Many of the statements in this article may not be new to the readers. It is quite possible, however, that they may have been forgotten during the stress of the war years. That doesn't seem logical if we reflect for a moment on the tremendous importance of good grinding and honing finishes on the important materials of war.

The practical machine tool man knows that good precision grinding and honing can be accomplished only with good tools, good coolant solution, and good workmanship. And, not the least important by any means is the matter of good coolant. For, as industry in the past studied

*Director of Public Relations, Fostoria Pressed Steel Corp., Fostoria, Ohio.



grinding operations with a view to improvement, the necessity for the proper coolant was readily evident.

With that knowledge, industrial operating officials have been careful in their choice of coolants for the multiple grinding and honing operations. As a consequence, coolants are selected and fitted to the job for best results.

Proper selection of coolant for the individual job, is not, however, the end of the story. In fact it is only the beginning. The coolant will not play the important part it can in the grinding or honing operations unless it is constantly kept free of sludge, dirt, grit, metal particles and other foreign substances.

So, the next logical consideration is the employment of a method whereby the coolant can at all times be delivered to the cutting tool absolutely clean.

The localized filtering method has been adopted quite widely thruout industry, and recommended strongly by machine tool builders—knowing that their machines will operate more satisfactorily when equipped with localized filtering units. One such localized filtering device

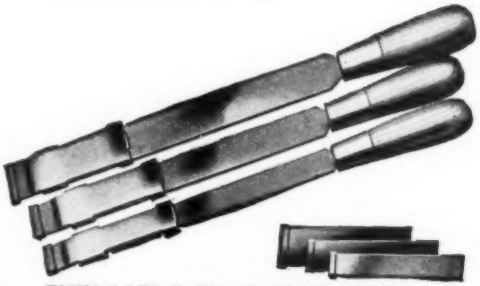
takes the dirty cutting fluid or coolant from the line, removes sludge, grit, etc., and returns a clean stream to the wheel or cutting tool.

The coolant is pumped from the coolant settling tank thru a non-metallic filter-

Anderson

CARBOLOY TIPPED SCRAPER BLADES

Speed up scraping operations with these efficient blades. They are especially good for hard alloy iron and the extremely hard bronze castings. If you are already using Anderson Hand Scrapers it is not necessary to buy complete new scrapers in order to use carboloy tipped blades. Simply remove the high-speed steel blade and slip in the Anderson Carboloy Tipped Blade. They are available in three widths.



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ing medium within the filter. The operation is achieved without retarding coolant flow. Filtering by this method creates no additional load on the pump, and the capacity of the pump determines the capacity of the filter.

A localized coolant filter, such as mentioned, should be installed as close to the work as practicable; usually just ahead of the coolant pump. Such a unit will handle most of the commercial coolants such as soda water, light cutting oils, plain water and soluble oil emulsions, etc.

With the localized filtering method each wheel or cutting tool is assured of sludge-free coolant and each operation may be supplied with the type of coolant solution necessary for best results. The conventional central system of filtration does not permit such flexibility for individual operations.

Once again I repeat, good tools, good coolant solutions and good workmanship, produce finer grinding and honing finishes. And, when the operator has been provided with a filtering device to keep coolants clean, the finer work is turned out automatically.

It is natural too, that work spoilage is reduced from that time on. A survey conducted among users of one localized filtering device revealed that in 80 per cent of the cases there was less work spoilage.

When clean coolant is delivered to the wheels, it minimizes the amount of foreign substance that can collect as the material is processed. The practical grinding man recognizes immediately that reducing the collection of such substances on the wheels, results in fewer times the wheel must be cleaned or dressed.

It has been demonstrated that with localized filtering methods it is not uncommon to get polish grinding production of 750 pieces between wheel dressings, as against 300 pieces without localized filtering.

Fewer wheel dressings naturally result in longer wheel life, less down-time, and, most important of all, increased production. And, now that everybody is clamoring for new cars, refrigerators, washing machines, etc.—and industrials are anxiously awaiting delivery of working tools and heavy equipment—seems all the more important to "up" production and speed up delivery promises.

It seems worthy of mention that an abrasive specialist writing in a trade publication some time ago, and commenting about certain defects in grinding, pointed

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The long, profitable service life afforded by Walsh Punch Presses is largely due to their rugged construction—with ample extra strength where it is needed. The heavy-duty frame is of semi-steel. Crankshafts are forged from tough alloy steel, normalized and ground. All parts of the clutch are centerless ground, hardened, forged alloy steel. The dynamically balanced flywheel has cast running bushing between wheel and crankshaft, and solid webs, for safety. Every Walsh press is equipped with our "two-button," foolproof safety device. Walsh Presses are available in capacities from 6 to 120 tons. Wire or phone for best available delivery.

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The Humm Universal Stock Reel is an essential device for the handling and feeding of coil stock to Power Presses.

1. **Adjustable Reel to fit various sizes of coil.**
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out the advantages of filtering coolants. On the matter of irregular marks of various lengths and widths and scratches on the product, he said the cause could be traced to dirty coolant, and recommended, "provide efficient filter, clean tank frequently, flush guards after dressing and when changing to finer wheels."

Speaking of such defects as wheel marks, short wheel life, not holding cut, and tapered work, he recommended among other corrections, the use of heavier coolants, and filtering of coolants.

A properly designed localized coolant filtering device will accommodate equally as efficiently such materials as aluminum, cast iron, brass, steel, glass or other compositions. Installed on compressed air lines, such filtering devices may also be used to remove water, rust, pipe scale and other foreign substances which clog valves and plug nozzle outlets.

Localized filtering units do a good job of filtering foreign particles from lake and river water when used in connection with rolling operations in paper mills. Also for purifying oil or hydraulic presses and for removing scale and dirt from water lines, required to cool transformers in connection with electric welding.

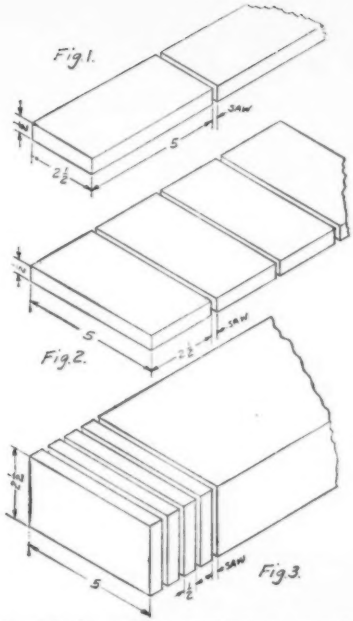
TURBINE BLADE SPEEDS

In a steam turbine the limit to volume of steam flow, and hence to economical capacity, is set by the length and diameter of the blades in the last row. As the blades get longer, the centrifugal forces tending to pull them out by their roots become enormous. Also the velocities of the blade tips at high turbine speeds become very large—which places emphasis on the best airfoiling.

Heretofore, the longest blade for the 3600-rpm turbines has been 20". The new blades, designed by Westinghouse Engineers and soon to undergo tests, are 23" long. At 3600-rpm this will mean a blade-tip velocity of 1520 feet per second—one third greater than the speed of sound. They will make possible steam turbines that can deliver 40,000-kw from a single-cylinder 3600-rpm condensing unit or 80,000-kw from a tandem 3600 rpm condensing unit. These outputs compare with 30,000-kw and 65,000-kw of the present largest 3600-rpm machines.

RECTANGULAR STEEL SIZES

In many industrial establishments, especially those manufacturing machine tools, it becomes the duty of the draftsman to specify stock sizes of steel, or any other metal, on drawings, bills of materi-



al and for other production records. Many times certain sizes are not immediately available and delays occur in shipping the finished products.

Such delays can many times be avoided thru the knowledge that rectangular stock sizes of a given width, thickness and length may be specified three different ways, and each piece contain the same cubic contents and weight.

Stock may be sawed off the bar according to the methods shown in Figs. 1, 2 and 3 in the accompanying sketches. For example, it is required to have pieces of cold drawn steel ½" thick by 2½" wide by 5" long.

In Fig. 1, the material is ½" thick by 2½" wide and is cut 5" long. If this size of stock is not on hand a piece ½" thick by 5" wide can be cut 2½" long as is illustrated in Fig. 2. In Fig. 3, a bar 2½" thick by 5" wide is cut off ½" long. Of course, the cutting-off time varies. It has been found that when such stock is standardized, the number of sizes carried can be reduced.

By H. F. WILLIAMS

MODERNIZING DUPLICATORS

A simple, inexpensive method whereby old types of duplicating machines limited to the use of hard models can be converted into up-to-date machines which work from soft models made of plaster or wood, has recently been announced by the Turchan Follower Machine Co., 8253 Livernois, Detroit 4, Mich.

By equipping the "hard-model" type of machine with a Turchan control valve, hydraulic cylinder and hydraulic power unit, it can be changed over into a machine with the full capacity of a duplicating machine of the most modern type.

STREAMLINE THE SURFACES
Superfinish
Six Models Of Machines
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For Superfinishing external, internal, tapered and flat surfaces. Also for Superfinishing milling cutters, reamers and cutting tools.
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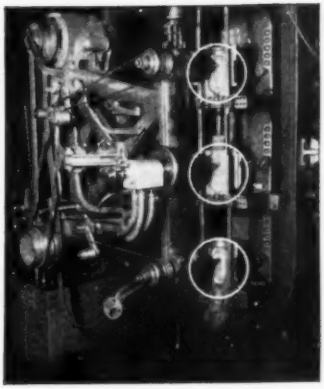
An oil and grease absorbent that replaces sawdust or wood shavings. Lessens fire hazard! Stops accidents due to slipping on oil or grease! Low priced — economical — safe! Write for FREE SAMPLE or ask for trial order at quantity price!
TAMMS SILICA CO., 228 N. La Salle St., Chicago 1, Ill.

As is universally recognized, the great advantage of a machine using soft models in the making of molds and in the sinking of dies is that production can be gotten under way much faster than with machines using hard or metal-sprayed models. Often a die-sinking job can be completed from a soft model of plaster or wood in actually less time than it takes to make the hard model.

The illustration shows an installation of the Turchan attachment designed for the purpose described, the machine being equipped to make two molds at the same time from a plaster model.



The attachment is also applicable to routers, profilers, lathes and milling machines to perform die-sinking operations, obviating the necessity of designing special machines for this purpose.

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Rollers constructed of seamless steel tubing with special long life springs. Curtain is of rubberized material impervious to oil and cutting compounds.

3 Standard sizes.
Special sizes to order.
Installed easily with simple brackets.

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24 E. Bethune **Detroit 2, Mich.**

ISOTHERMAL TREATMENT

A technical bulletin,—"Bearing Races Improved by Isothermal Treatment" is available from Ajax Electric Co., Inc., Philadelphia, Pa.

It cites an outstanding benefit to be derived from the treatment discussed therein:—namely, that distortion was less than previously obtained in one-at-a-time oil quenching on a die-press machine! This should be of interest to all bearing, gear and bushing manufacturers as well as plants now using quench and temper treatments or where costly die-press machines must be used in order to control distortion of many heat treated metals.

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Use any Standard Knurls 3/8" x 3/4"

Two Sizes:
1/16" to 2"
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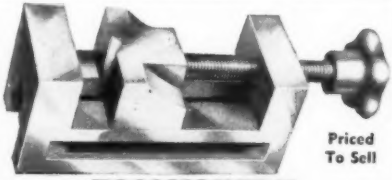
FOR LARGE OR SMALL LATHES



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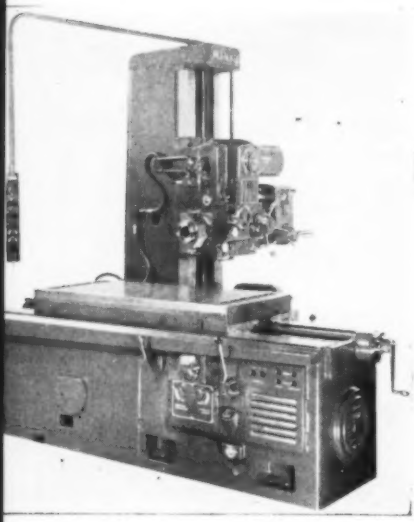
WHAT'S NEW IN METALWORKING

COMBINATION MILLING AND BORING MACHINE

THE Kearney & Trecker Products Corp., Milwaukee, (a Kearney & Trecker subsidiary) has started manufacturing operations on a high precision milling and boring machine. It is identified as their No. 3, Model T and represents a modern example of a line of equipment developed by the parent corporation over a decade ago for handling work in their own plant which demanded extreme accuracy.

General application of the machine includes precision milling, boring, and threading operations in one setup on special machine members, gear boxes, box jigs, fixtures, and precision production work.



Special attention has been given to maintenance of the close alignments. Table is fully supported thruout its entire travel. Ram type construction of spindle slide maintains alignment whether it is locked in position for milling operations or released while boring feeds are in use. A rear bearing extension eliminates overhang at back end of spindle ram and fully supports attached gear box during entire ram travel.

Means for complete operational control of table have been placed on each side of bed. Spindle rotation is electrically controlled thru a swiveling pendant which contains switches for starting and stopping, forward or reverse, inching, and spindle brake. All controls for spindle speeds and boring feeds are placed in the self-contained spindle head. The entire range of spindle speeds is obtainable thru a single speed selector crank and one two-position range change lever. Boring and threading feed changes are effected thru pick-off gears located under a convenient cover in spindle head.

Since the longitudinal and vertical screws are used primarily for actuating table and spindle head for milling feeds and rapid traverse, an end measuring system is supplied as standard equipment. All operating movements of machine can be controlled to .0001" thru built-in dial indicators. A four-position stop on spindle ram facilitates step boring operations. A drive bracket can be provided for driving 16", 20", or 24" rotary tables.

Working surface of table is 24" x 54"; table travel—longitudinal (hand or power) is 42"; spindle head travel—vertical (hand or power) 27-3/4"; spindle center to table top, min. 1¼", max. 29"; column travel—(hand only) 12"; face of spindle to table centerline min. 1¼", max. 25½";

SHELDON

S-56 LATHE

- Heavy bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

. compare a SHELDON S-56 Precision lathe with all other 10" lathes in the moderate priced field, and you'll find more accuracy, more capacity, more convenience, more design, more quality . . . **from any angle just more lathe.**

The SHELDON S-56 lathe has a bed length of 56", with rigid T-girted bed with 2 V-ways and 2 Flat ways which are ground and hand scraped to .0005" of both lateral and parallel alignment. Lead screws are cut on the finest Pratt & Whitney "super precision" lead screw machine. The S-56 lathe with 56" bed is mounted on a rigid 5 drawer steel bench (S-44 with 44" bed on a 4 drawer steel bench) which houses an efficient 4-speed (8 spindle speed) underneath motor drive. Each come with full quick change gears, power longitudinal and cross feeds and standard big lathe features.

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FIREBOX 7¾" high 13" wide 16½" long

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A large sized unit for quick, accurate heat-treating high-speed steels, dies and tools. Reaches operating temperatures FAST to save time and gas. Counterbalanced door opens upwards. Insulating refractory lined. Use 4-Burner Unit for temperatures 1400-2000° F. 6-Burner for 1800-2400° F. Complete with Carbofrax Hearth, G.E. Motor and Johnson Blower.

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Name .....
Address .....
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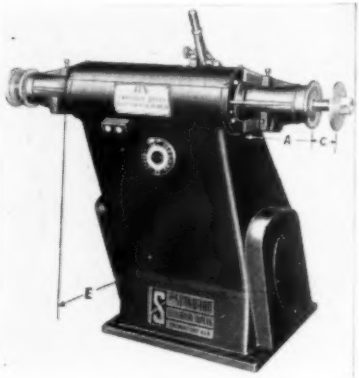
spindle end—National Standard No. 50; spindle speed range 35-1400 rpm.

"RV" STANDARD BUFFER

Standard Electrical Tool Co., 2486 River Road, Cincinnati 4, O., announces addition of Type RV to its line of Infinitely Variable Speed Buffing and Polishing Machines.



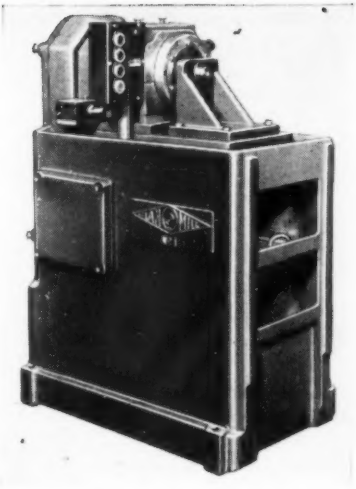
It is available in 5 hp and 7½ hp sizes. Any spindle speed between 1,500 and 3,000 rpm is instantly obtained thru the Speedial control. This permits handling of a variety of materials and work, with correct speeds for buffing or polishing. As wheels reduce in diameter, spindle speed can be increased, for maintaining the desired peripheral speed on wheels.

Equipment includes a coincidental switch-brake for stopping spindle and shutting off current, a separate push button station being used for starting motor. Shaft lock for use in changing wheels is conveniently located.

Spindle overhangs front of the base. The "E" dimension is 13 inches. There are four ball bearings in liberal-size oil reservoirs, with sight feed oil gauge on each bearing housing.

PLAN-O-MILL MILLING MACHINE

The Plan-O-Mill Corp., 1511 E. Eight Mile Road, Hazel Park, Mich., announces a new planetary milling machine, designed especially for high-volume, low-cost thread milling and form milling. Called Plan-O-Mill No. 1, it differs from previous planetary milling machines in



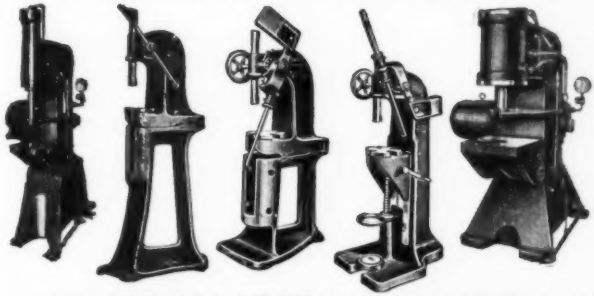
size—less than 9 square feet in all—and unusual ease of operation. Completely antifriction, it provides, according to the manufacturer, thread-milling accuracy with tapping speed. It incorporates such earlier Plan-O-Mill features as push-button operation, coordination of feeds and speeds and Thy-mo-trol electronic feed control—engineered by G-E and pioneered on Plan-O-Mill—for split-thousandth control of feed-in and feed-around.

With the use of No. 1, a complete part can be milled in a single operation, requiring as little as 8 seconds. Since the part itself does not move—revolving cutter being fed around the work—large and cumbersome parts may be handled. The machine has facilities for either external or internal threading, and threads and mills parts up to 2" ID or OD, or larger with offset head. It is operated by means of an electronic control panel, which may be mounted on floor, wall or ceiling.

PREHEATING MAGNESIUM SHEET

How the installation of a compact, portable furnace eliminated a complicated arrangement for the preheating of magnesium sheets was recently demonstrated at the Consolidated Vultee Aircraft Co., Benbrook, Texas.

For ASSEMBLY, BROACHING, and BENDING



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65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

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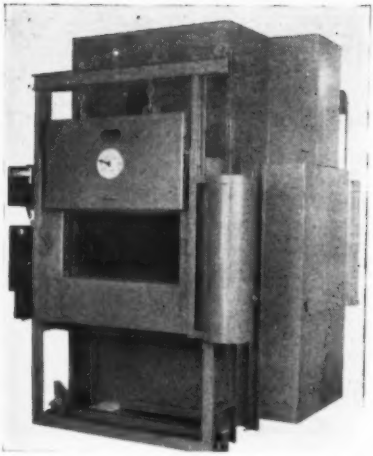
NASHUA Est. 1883 NEW HAMPSHIRE



Operations at this plant required the preheating of magnesium sheets before pressing and forming. To do the required preheating, Despatch engineers designed a furnace of simple but effective design. Portability was one of the prime factors so the furnace was provided with large easy rolling casters so the unit could be moved from one press brake to another as operations demanded.

By introducing heat into the furnace from the top and bottom and with recirculating ducts on both side walls, uniformity of within plus or minus 5°F was obtained. This system allowed even heating of the sheet whether in a flat condition or in a partially formed shape in event the entire forming operation could not be completed in one press operation.

Smooth, fast operating vertical lift doors at each end of the Despatch furnace permit rapid handling of the sheets in order to prevent cooling before forming. Doors are arranged so they seal up against the furnace body when in closed position keeping heat from the operator.

By having a fan of large capacity, over 40 air changes per minute are obtained in the furnace. This assures fast uniform preheating and increases production.

Furnace was made by Despatch Oven Co., 619 S. E. Eighth St., Minneapolis 14, Minn.

ROGERS "NT" KNIFE GRINDER

5 SIZES
48", 72" 90",
110", 134"

Saves Time & Knives

One of America's largest roofing manufacturers depends on this heavy-duty Rogers Grinder for keen cutting edges. Saves knife wear. Also widely used for shear blades in leading plants. Exclusive features; backed by 59 year reputation. Send for circular "NT".

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ROGERS KNIFE GRINDERS

STOP

WASTING TIME making or looking for solid arbors . . . A SET OF

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Fits All Bores 1" to 7"

Hardened tool steel, accurately ground. Two types: step and straight jaw. Sold singly or in sets. Prompt delivery. Bulletin 1043.

Top table applies to Type A, step jaw; bottom to Type B, straight jaw.

Size No.	Range of Bores Taken	Length Overall
1A	½" to 1"	9"
2A	1" to 1½"	11"
3A	1½" to 2"	12½"
4A	2" to 3"	20½"
5A	3" to 4"	21"

Size No.	Range of Bores Taken	Length Overall
1X	½" to ⅞"	5"
2X	⅞" to 21/32"	6"
3X	21/32" to ¾"	6"
00	¾" to 7/8"	8½"
0	7/8" to 1"	8½"
1	1" to 1¼"	9"
2	1¼" to 1⅝"	11¾"
3	1⅝" to 2"	13¾"
4	2" to 2½"	17¼"

W. H. NICHOLSON & CO.
117 Oregon St., Wilkes-Barre, Pa.

Specify **ROCKFORD** PULLMORE MULTIPLE-DISC **CLUTCHES** *For*

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HIGH TORQUE
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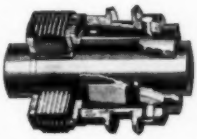
PRECISION BUILT
LONG WEAR LIFE
EASY ADJUSTMENT



*Precision machining and grinding, proper hardening and the symmetrical contours of PULLMORE Multiple-Disc CLUTCHES insure perfect balance and smooth operation at both high and low speeds. Because of this close-tolerance construction and compact design the powerful pull of PULLMORE CLUTCHES is not affected either by centrifugal force or the direction of rotation.

SEND FOR THIS BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications Every production engineer will find help in this handy bulletin, when planning postwar products.

PULLMORE CLUTCHES

ROCKFORD CLUTCH DIVISION
[Formerly Known as Drilling Machine]
Borg-Warner Corporation
1309 Eighteenth Avenue, Rockford, Ill.

NO. 60 UNIVERSAL TOOL AND CUTTER GRINDER

A new No. 60 Universal Cutter and Tool Grinder is announced by Gallmeyer & Livingston Co., 405 Straight Ave., Grand Rapids 4, Mich., replacing their No. 6 machine.

Design of the machine provides for raising and lowering grinding wheel head and column and also for the cross feeding of head and column, so that position of sub-table and table remain fixed insofar as either vertical or transverse movement is concerned. This means that is is possible for operator to stand up close to his work at all times, and weight of the attachments in service and work are carried directly over the supporting base.

Vertical movement of machine is provided by dovetail ways on the two sides of the raising and lowering column and these ways are carefully protected against grit and dirt. When wear finally occurs after years of service, an adjustable gib provides a simple method of compensating for wear.

A master hand wheel which provides for three speeds of longitudinal table travel —½", 3½" and 8¼" per revolution is standard equipment, and may be used at either right or left hand side of front of machine.

The sub-table which supports table proper is carried on ball bearings in suitable micarta track on carbon steel ways having hardened and ground tool steel inserts.

Machine is equipped with a greased-for-life precision ball bearing cartridge type spindle which requires no lubrication for life of the bearings, and a one-shot system mounted in a convenient position in front of column provides for lubrication of the machine proper.

All rotating shafts are mounted on grease-sealed ball bearings; dust-tight and guaranteed for life of the machine.

Spindle is driven by a ¾ hp dynamically balanced motor mounted on head of machine, and provision is made for four spindle speeds.

Inasmuch as many users of these ma-

KUTMORE HIGH SPEED ADJUSTABLE HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery — even on specials. *Write for Catalog No.* 15.

CARL WIRTH & SON, 1625 Clinton Ave., N, Rochester 5, N. Y.

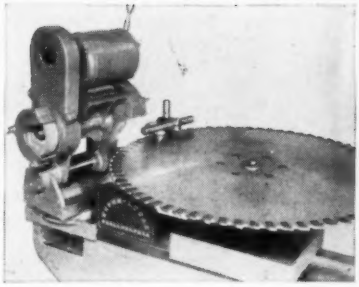
chines desire to use a coolant when grinding carbide tipped milling cutters, the No. 60 Grinder may be obtained with a portable motor driven coolant system.

It is also possible to supply the machine with a built-in motor driven dust collecting system.

Table is 5½ x 38″; swing diameter is 12″; swing length between tailstocks is 27″; between work head and tailstock 24″; face mill capacity is 16″; longitudinal table movement is 16″; cross wheel movement is 8″; vertical spindle movement is 8″. Table swivels in either direction 90°. Graduations on end of table for taper per foot, 3″; graduations on swivel plate, 360°. Spindle speeds are 2850, 3850, 4350 and 5800 rpm. Work head speeds are 265 and 370 rpm. Internal spindle speeds are 9100, 12300, 13900 and 18500 rpm.

SAW BLADE GRINDER

A new circular saw blade grinder of unusually heavy, rigid construction for sharpening inserted-tooth metal-cutting saws has been announced by Espen-Lucas Machine Works, Front & Girard Ave., Philadelphia 23, Pa. The unit is designed to grind teeth accurately and uniformly to within .001″ and also maintains proper

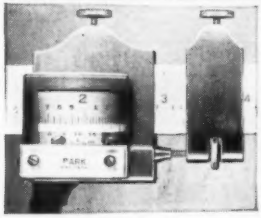


tooth contour. These features assure greater saw cutting speeds and lengthen intervals between sharpenings. The grinder, Model No. 27, has the capacity to handle blades from 18″ to 48″, and can be increased to 60″. Motor requirement—¾ hp, 1,800 rpm (approx.); floor space—7x15 ft.

BRINELL TESTING MACHINE

A Brinell Testing Machine of the manually operated bench type for the hard-

The EYE-SPI MAGNIFIER



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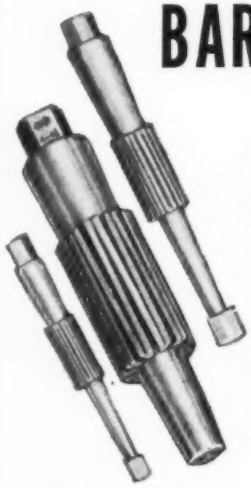
ness testing of metals is announced by Steel City Testing Laboratory, 8843 Livernois Ave., Detroit 4, Mich., to be known to trade as Superior Model-J.

It is particularly designed to meet the requirement of the smaller shops, heat-treat plants, laboratories, schools, etc. The well known Multi-Beam and Dead Weight principle is employed, with weights accurately calibrated for loads of 500 to 3,000 kilograms. A suitable Hydraulic Dash Pot is incorporated, which eliminates shock on the load as it is applied.

Standard equipment furnished with machine, consists of a Flat Anvil also "Vee" Anvil for testing of rounds, and a standard Brinell Microscope with micrometer scale and case.

MECH-ART 25-TON HYDRAULIC PRESS

A wide variety of pressing, straightening, bending, flattening, assembling and other operations can be performed on the 25-ton hydraulic press manufactured by the Mech-Art Products Corp., York, Pa. The press is self-contained; thus it can be located in the most convenient place and moved about at will. Power is applied by hand operation, and eight strokes of the



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No.	Range Inches	Price
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M1	1/2 to 11/16	5.75
M2	11/16 to 1	7.75
M3	1 to 1-9/16	12.00
M4	1-9/16 to 2 1/2	22.00

HEAVY DUTY MANDRELS

M25	11/16 to 27/32	8.00
M26	27/32 to 1	8.75

No.	Range Inches	Price
M35	1 to 1-9/32	$12.50
M36	1-9/32 to 1-9/16	14.00
M45	1-9/16 to 2-1/32	20.00
M46	2-1/32 to 2 1/2	22.50
M5B	2 1/2 to 3 1/4	44.50
M5C	3 1/4 to 4	44.00
M55	3 1/4 to 4 3/4	89.00
M6B	4 to 4 3/4	70.00
M6C	4 3/4 to 5 1/2	76.00
M5	2 1/2 to 4	68.50
M6	4 to 5 1/2	100.00

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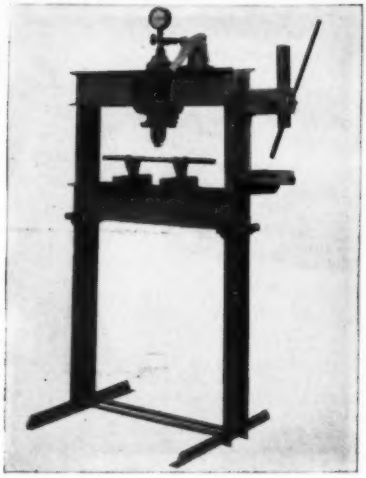


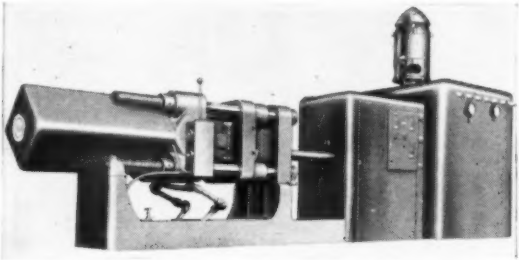
pump equal 1" of ram travel, which results in fast press action.

The press cylinder is a steel casting of maximum strength. The table is supported by two alloy steel pins, which rest in four inverted V-bearings. Handle grips at end of table permit immediate adjustment in the height of table to handle various-sizes of work. Distance between uprights is a full 30", to handle long shafts. The table travel is 35", ram travel is 4½", ram diameter is 2¾", width between table channels is 5⅛". Overall height is 60" and floor space required, 34" x 27½". Weight is 420 lbs., with arbor press.

"JO" GAUGE BLOCKS

Catalog No. 17 of the Ford Motor Co., Johannson Div., Dearborn, Mich., provides a comprehensive introduction to the development and use of "Jo" gauge blocks as measuring standards. Included in the 36 pages of text are illustrations and descriptions of the various standard sets of blocks, accessory equipment, information on the care and handling of these blocks, an inspection service and a reference conversion table for English and metric measures. The many illustrations show the uses of these blocks in a large number of set-ups.

HARVILL HEAVY DUTY DIE CASTING MACHINES



A fourth basic model of the new line of die casting machines, known as the HDW Series, has been announced by the H. L. Harvill Mfg. Co., P.O. Box 335-P, Los Angeles, Cal. This machine is a heavy duty, high capacity cold chamber type of die casting machine with provision made for addition of a hot chamber furnace and an injection attachment so machine also may be used for automatic high speed casting of Zinc, Tin, or Lead alloys.

The HDW Series of machines is offered in three sizes, with model designations of HD-1W1, HD-2W1 and HD-3W1. All are engineered for high production under adverse conditions, with heavy duty construction thruout.

The hydraulic system provides hydraulic pressures from 200 to 1000 psi delivery which may be regulated by operator, dependent upon pressure requirements of the casting to be done. Locking pressure on dies is automatically compensated for increase and decrease of injection pressure. Centrifugal pump is driven by a 15 hp motor with consumption of electrical energy increased and decreased as pump accelerates or decreases in its delivery of fluid. Load on pumping unit is not constant as is the case with most hydraulic systems, placing pumping unit under high load only when machine is

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THE *New* **DEARBORN** **MODEL "B"** **CHUCKING and INDEXING FIXTURE**

FOR USE ON MILLING MACHINES

The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.

Work held by automatically opening and closing collets Work automatically ejected Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces

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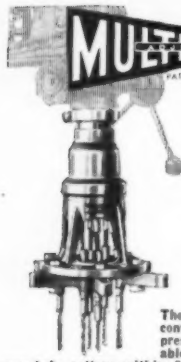

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Your drill presses equipped with adjustable MULTI-DRILL heads will

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- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—1" minimum centers. Standard capacity 3/32" to 1/4" drills. Modifications available for special applications.

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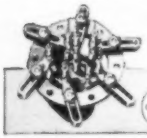

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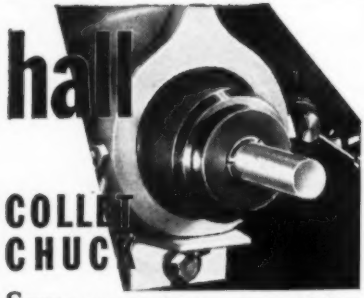

SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007—without adjustments...no bearings, friction, heat or loss of power. Instant release without stopping lathe.

Two-inch capacity, now only $145
One-inch capacity, $95
Round, square or hex collets, plain—serrated

HALL MANUFACTURING COMPANY
622 Tularosa Drive • Los Angeles 26, Calif.

in operation. This design substantially increases life of pump, decreases demands of entire hydraulic system and means lower operating cost due to less constant load on pumping unit than is the case with conventional hydraulic systems. In the event high speed output is not required, one hydraulic system can be used for more than one machine, each machine operating in proportion to the hydraulic system capacity of 400 cycles per hour.

The HDW Series machines are particularly adapted to casting copper base alloys. As an accessory, a conversion unit is available which replaces the cold chamber injection mechanism, and in less than two hours installation time converts the HDW cold chamber machine to a hot chamber automatic machine for casting Zinc, Tin, and Lead alloys.

Normal vertical die dimensions are HD-1W1—13"; HD-2W1—15" and HD-3W1—21". Normal horizontal die dimensions varies from 24" for the HD-1W1; 28" for the HD-2W1 and 30" for the HD-3W1. When arrangement of cavities permits, horizontal die dimensions may be increased as much as 50%. Pressure on injected metal varies from 3400 psi using the largest size cylinder, to 11,800 psi, using standard injection cylinder.

When using the largest size cylinder assembly a maximum of 10 lbs. of aluminum alloy or 33 lbs. of brass may be cast; when using standard size cylinder assembly for maximum pressure, a maximum of 1.7 lbs. of aluminum alloy is cast and a maximum of 5.6 lbs. of brass may be used.

"THREE-WAY" BENCH FURNACE

Designed to fulfill the requirements of a wide variety of applications, a new "three-way" bench type Universal Laboratory Furnace UL-6-12 is available from Surface Combustion Corp., Toledo 1, Ohio. Controlled operation over a wide range of temperatures further enlarges its field of use.

The furnace combines three different types of furnaces in one casing. It may be used as a direct-fired oven unit at temperatures from 300° to 2400°F. For direct heating, a muffle can be placed on the hearth. If an atmosphere is desired, a diamond block can be used in the muffle. A removable plug built into the arch of the furnace provides a means of inserting a pot.

This laboratory furnace is adapted for small shops or laboratories where a wide variety of heat treatments in relatively small quantities of small parts must be

SMALL BUT MIGHTY

It's a LITTLE Grinder by comparison with an average size Swing Frame Grinder, but it's a MIGHTY BIG Grinder in terms of its WORK by comparison with performances of electric hand grinders and flexible shaft machines! It's the Marschke direct-drive "In-Between" Grinder.

The combination of direct drive from motor to wheel and simplicity of construction accounts for far greater durability and dependability than can be expected of a machine with flexible shaft drive. That, in turn, means it is more economical.

For further details and specifications, write to:

VONNEGUT MOULDER CORP. 1805 MADISON AVENUE INDIANAPOLIS 2, INDIANA

MORE SPEED — MORE SUPPORT

MORE WORK

"EXPAND YOUR PRODUCTION" with PADDOCK BALL-BEARING BAND SAW GUIDES . . . .

Designed for hard continuous service—made in several sizes and models— PADDOCK BALL-BEARING GUIDES are recommended for both old and new equipment. Interchangeable wheels, running with the blade, give strong support—holding the blade as if it were in a frame. With PADDOCK GUIDES you can get more work done and "expand" without buying additional machines.

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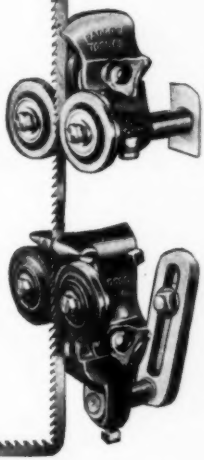

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EXPANDING MANDRELS

Twelve Champion Expanding Mandrels will do the job of hundreds of solid mandrels . . . **completely** and **accurately** filling any hole from ½" to 6½". The flexible round sleeve on the tapered arbor automatically sizes to the most minute variation. Save time and reduce costs with Champion Expanding Mandrels.

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The WESTERN Tool and Manufacturing Co.
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New STEEL
INSPECTOR'S STAMPS

Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.
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performed. Such operations as annealing, carburizing, hardening, cyaniding and tempering, with or without a furnace atmosphere can be handled by the one furnace. It functions as a direct-fired oven, indirect heated muffle, gaseous atmosphere, salt or lead bath type and may also be used for melting soft and light metals such as tin, lead, aluminum, magnesium, etc.

Surface Combustion Universal Laboratory Furnace with accessory equipment including (A) muffle, (B) protective atmosphere equipment, (C) plug, and (D) pot.

The furnace is equipped with three atmosphere-type gas burners, each of which can be independently controlled. Burners are arranged under the hearth to provide uniform and rapid heating thruout the heating chamber. A gas pressure regulator assures uniform control of burner operation. Fuel under low pressure without air under pressure is sufficient for burner operation, such as manufactured or natural gas at 3 to 6" water pressure, or butane or propane at 9 to 11" pressure.

To assure economical application where all the features of the unit are not desired, the muffle and certain other equipment are offered as accessories. Temperature indicators are also in this category, and are available if desired.

Hearth width and length is 6 x 12"; door width and height, 5¼ x 4¼"; overall dimensions, width 19½"; length 21-5/8"; height 29". Hours to heat from cold to 2400°F—2. Maximum gas demand 90,000 Btu per hour.

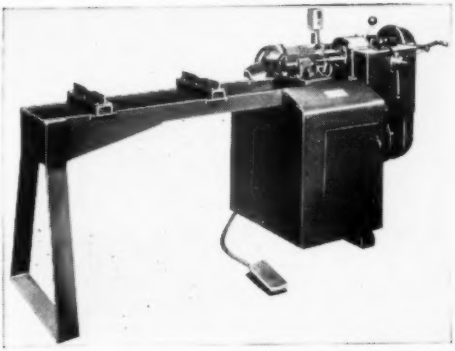
DRILLING-TAPPING MACHINE

The Cleveland Tapping Machine Co., 3610 Superior Ave., Cleveland, Ohio, has produced a horizontal combination drilling and tapping machine for high production drilling and tapping of extra long pieces, up to 96" long, with only one handling.

The work piece is loaded against a stop then automatically clamped in position and is not moved until drilled and tapped.

An outstanding feature is the possibility of drilling then indexing to tapping position and tapping the work piece to proper depth. In this manner the possibility of misalignment is eliminated. Each spindle can be independently adjusted for depth of travel and each spindle can be held to within .010" horizontal travel. All spindles are equipped with oversized ball bearings.

The machine has five speeds and can drill and tap from 1/8" to 1/2" NC in steel.

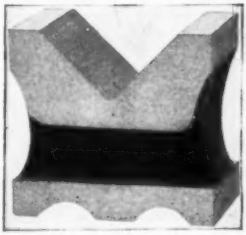


The tapping spindle revolves at 60% of the drilling spindle rpm.

BOWSER ADDS KOLD-HOLD

Bowser, Inc., liquid control specialists, (Chicago and Fort Wayne, Indiana) re-

"TRU-V" BLOCKS



Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3½ to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
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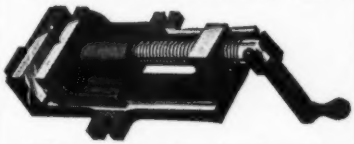
YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

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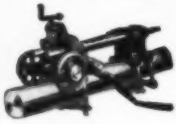

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

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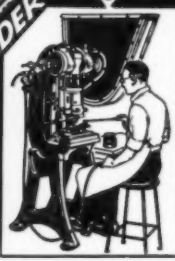
SAFETY FEEDER
KEEPS HANDS OUT OF DANGER ZONE



YOU owe it to your workmen—to safe, fast production—to keep their hands out of danger zone—with the Pres-Vac Safety Feeder. Vacuum pick-up. Handles flat pieces of various weights and sizes. Trigger action. Mechanical Pickers available. **Request Bulletin**

F.J. LITTELL MACHINE CO.
4153 RAVENSWOOD AVE. CHICAGO 13 ILL.

cently acquired the Industrial Temperature Cabinet equipment business of the Kold-Hold Co., Lansing, Mich., as announced by R. Hosken Damon, President of the Bowser Corp.

Damon pointed out that the low temperature equipment business would be consolidated with the Refrigeration Division of Bowser, which is located in Long Island, N. Y. He also announced that this entire division would be moved to a new home in the near future and that these units would be called by the trade name "Bowser-Kold-Hold."

LINCOLN "FLEET-ARC, JR."

A new low-priced welder is announced by The Lincoln Electric Co., Cleveland, Ohio.

Called "Fleet-Arc, Jr.", it is for 230 volts, single phase power lines and meets the limited input requirements of rural Utilities and REA by a design of high efficiency and high power factor. It has a maximum input current of 35 amperes and provides a machine which meets the new NEMA standards for this type of welder.

It can be used with standard 3-KVA power transformers provided by the power companies. Current range is from 20 amperes at 20 volts to 180 amperes at 25 volts welding duty. This gives sufficient capacity for types of jobs found on most farms or job welding shops. It will handle electrodes ranging from 1/16 to 5/32" diameter.

The "Fleet-Arc Jr." embodies an innovation known as the "Arc Booster" which provides quick, easy arc starting. The instant electrode touches the work, welding current is given a boost of intensity for starting the arc.

The current then reverts automatically to the amount set for the job. No high voltages or special high frequency devices are used, the output voltage being limited to a maximum of 52 volts.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

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Cut Clamping Time
50%—OR MORE!

Cardinal SPEED VISE
Opens and closes full range instantly. Locks and unlocks with half-turn.

Cardinal Automatic AIR VISE
Synchronizes vise opening and closing with machine tool cycle—completely automatic.

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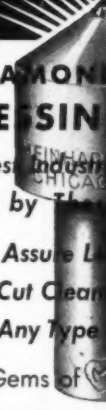

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★ THE ★ WONDER CUTTER

The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely.

Hand operated. A giant for work, cuts wire and rods up to 5/8-in. round or 3/8-in. square and band iron up to 1/8 in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices.

The Federal Foundry & Supply Co.
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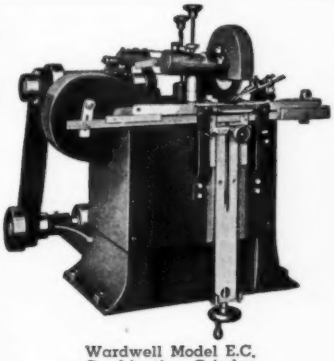
Saves Cutting Hours and Blade Replacements

Often pays for itself within a few months



Wardwell Model E.C. Combination Grinder

Proper sharpening of even as few as two gross blades will pay for this grinder through savings in blade and labor.

The only single unit grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. This unique feature enables operator to grind a variety of blades without dressing or changing wheels.

Write for details

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GREAVES-SILENT BAKELITE GEARS

No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads . . . their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time . . . Money . . . Labor!

We also make silent gears of rawhide and Fabriol.

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BELT LACING
Both types from 1 source

BELT HOOKS come with blue aligning cards that prevent waste—every hook can be used. Protects fingers. Applied with a **WIREGRIP** or any other standard Belt Lacing Machine. 6 sizes.

STEELGRIP BELT LACING

A strong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided. 11 sizes. In boxes, handy packages, cartons and long lengths.

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5364 Northwest Highway, Chicago 30, U.S.A.

Either of the two degrees of arc boosting provided is selected by a snap switch, one for general work and the other lower amount for thin material.

Current control is of the separate adjustable reactance type, varied by turning a hand wheel. Adjustment is continuous over the entire welder range of from 20 to 180 amperes.

Design and construction features include:

Wear-free and vibrationless reactor current control with self-cleaning chain drive. No taps or plugs to develop loose connections.

Heavy copper winding with spun glass insulation and mica coil separators. Arc welded steel frame and housing.

"Fleet-Arc Jr." weighs only 360 pounds and is, therefore, readily portable.

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Straight Cylindrical, Shoulder, Profile, and Multiple Diameters . . . Long Bar Grinding . . . Ground Taper Pins and Dowel Pins.

Screw machine products. Heat treated and ground if necessary. Improved and expanded facilities assure prompt and accurate service.

Send your blue prints or samples for estimates.

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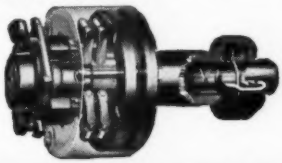
SAVE TIME & LABOR

Drive your productive machinery by the powerful, persistent torque developed by MULE-PULL Clutches . . . it saves time and boosts production by the smooth and instant acceleration it gives. The Loose Sleeves of these Clutches have RING-OILING lubrication which prevents ground-out bearings and avoids costly repairs. The single-arm, anti-friction ROLLER TOGGLES which actuate these Clutches give high horsepower capacity; require no lubrication and are free from repairs even under constant in-and-out engagement. SEND FOR BULLETIN No. 25-B.



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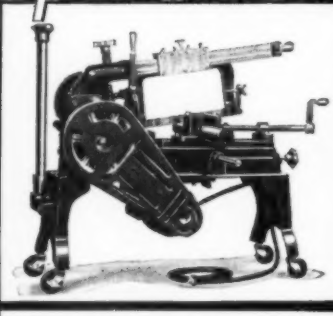
ELECTROLIMIT EXTERNAL COMPARATOR

To facilitate an exceptionally fast and accurate means of inspecting parts, Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., announces a new Electrolimit Comparator. By use of this simple and ingenious device, a P&W Electric Contact Unit is combined with the P&W Electrolimit Head to produce a unit for accurately detecting product limits. Little neon tube undersize and oversize lights are positioned at sides of the meter, requiring only one line of vision for both lights and the meter.

During inspection, the operator knows in an instant whether the part is undersize, oversize or within the limits by watching the limit lights. Minus light on the left, being normally on, will remain so when the part is undersize. When the part is oversize, the minus light will be turned off and the plus light on the right will flash on. When part is within the determined limits, both lights will remain off.

Should operator desire to make an actual size reading of any part being checked, it is only necessary to slow up the high-speed gaging operation sufficiently to take reading on the indicating meter.

POWER HACK SAW



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Ready to Work—Economical
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PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

Precision LAPPING POWDERS for PRECISION work

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
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There is a STAR DUST Field Serviceman in your territory.

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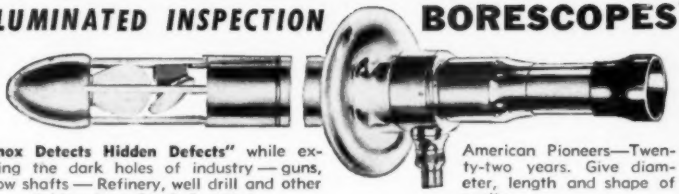

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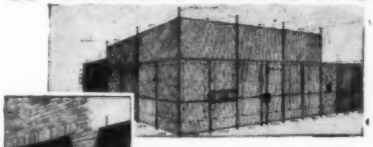

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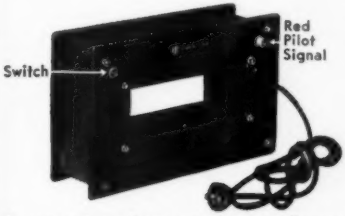

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Standard units available and special sizes to order.

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A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{3}{16}$" to 1" diameters. *Send for price list.*

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For Machine and Tool Work & Quick Set-Ups

The only 3-way reading precision indicator. Accurate in either direction. Feeler mounted in centered cone bearings. .014 reading.

Price $5.00 plus postage. Write for folder.

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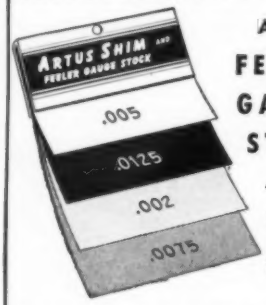

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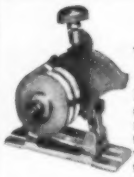

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VARIABLE SPEED TRANSMISSION

For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

(3 Types—8 sizes to choose from)

Standard Transmission Equipment Co.
3409 VERDUGO ROAD LOS ANGELES, CALIF.

A GREATER METAL SHOW

Industry's interest in introducing new developments and preparing for post-war sales is at an all-time high, judged by advance exhibit space reservations in the 27th National Metal Exposition, to be held the week of February 4 in Cleveland's Public Auditorium.

"Representative manufacturers from all branches of the metal-working industries have already reserved 98 per cent of the available floor space", according to W. H. Eiserman, Managing Director of the Exposition, and National Secretary of the American Society for Metals, sponsor of the event.

"With more than 430 companies represented", Eisenman continued, "total display area will be more than eight acres. This will be the largest industrial show ever held, exceeding the metal show of a year ago by some 25 per cent."

Conservative estimates of attendance to the Exposition are in excess of 30,000 industrial executives and engineers. Cleveland hotels will be packed and a special housing bureau has been set up by the Cleveland Convention and Visitors' Bureau to handle rooms in apartments and private homes.

SIMPLE ARITHMETIC

Industry can pay only on the basis of production, out of what it earns. Taxes and dividends both flow from the same source. But, with the share taken by government constantly increasing and with a return on investment proportional to capital risk being steadily curtailed, business progress is hindered as new enterprises in particular find it difficult to attract fresh capital funds.

SHEFFIELD CARBIDE GAGES

A complete range of tungsten carbide thread plug gages, both standard and special, is announced by the Sheffield Corp., Dayton, Ohio. All the popular standard sizes are carried in stock while other standard sizes are available for quick delivery. Extra good service is also given on semi-standard and special gages.

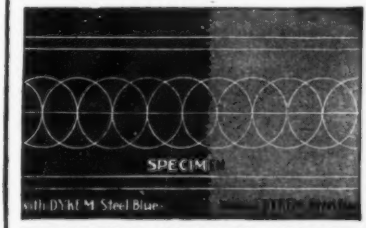
Tungsten carbide thread plug gages are normally used on high production and close tolerance jobs. Their wear-life is many, many times that of any specially treated or chrome-plated steel gage when handled with proper care. Due to the extreme hardness of tungsten carbide, gages made from this material make it possible to produce parts to closer limits as no wear allowance is necessary.

The PRUTTON *Tapmaster* • • •

3 TAPPING MACHINES IN 1

Speedy; can do three jobs at once, tapping any size hole up to 7/8". Three separate motors. Single or continuous cycle. Positive feed by husky lead screw prevents tearing of threads. Safe—no jamming of work. Ample tanks for coolant oil—ready accessibility. Descriptive bulletin. 3/4" awning eye-end and 3/4" pipe cap; 1500 per hour on Tapmaster.

D. H. Prutton Machine & Tool Co.
5295 West 130th St., Cleveland 11, Ohio



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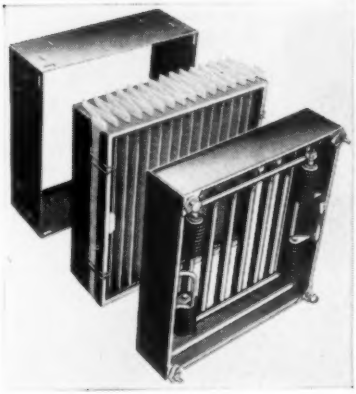
ELECTRO-AIRMAT

The latest addition to the American Air Filter line of electronic air filters is the Electro-Airmat in which the collector element is electrostatically charged Airmat paper. Introducing an entirely new principle in Electronic air filtration, the arrestance rating of the Electro-Airmat, when tested by the Discoloration Method, is said to be 90% or better with atmosperic dust or smoke. This efficiency is obtained at the normal velocity of 35 fpm thru the Airmat media and the standard rating of 1,000 cfm per standard-sized 24"x24" unit. It is claimed that the filter



weighs 40% less than Electronic filters having metal plate collectors and requires 30% less floor area.

Airmat is American Air Filter's trade name for a cellulose product composed of a number of plies of porus, tissue-like sheets formed of short cellulose fibers in "jack-straw" arrangement. It is unlike any other filtering media. When an electrostatic charge is applied to Airmat, the plies tend to separate and each individual fiber becomes a collecting electrode which attracts and holds the dust and smoke particles. Airmat is also a highly efficient mechanical filtering media; thus, when the power is off for any reason it affords ample protection against the infiltration of dust due to "stack effects" in air conditioning systems.

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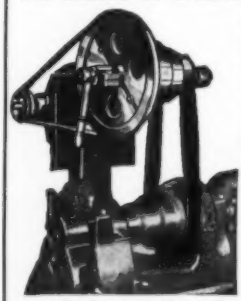

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Gage Material .040 to .125
Pin Diameter .101 to 3/8
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FITS ANY STANDARD DRILL PRESS (2¾" column) own table tilts to 45 degrees; swings out of way when not in use. Delivers 700-4500 surface feet of abrasive per minute ranging from 7000-36,000 RPM at ½" spindle. Small cost, immense labor and time saving.

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es due to fewer wire ends. The power pack operates on a 110 volt 60 cycle single phase current. Total power consumption is approximately 220 watts at 110 volts including transformer losses in the power pack, etc. When the Airmat paper has accumulated its dust load it is removed and replaced with clean material by means of turning a crank in a mechanical loader which automatically folds the paper into the serrated base section of the filter unit. Spare cells loaded with clean Airmat can be provided for convenience in servicing. For small installations requiring only a few units, a manual loader answers the purpose. Additional data is available from American Air Filter Co., 312 Central Ave., Louisville 8, Ky.

TAPER PIN SPECIFICATIONS

A compilation of standards for precision ground taper pins, based on the manufacture of precision ground taper pins, is now available to engineering, processing or purchasing departments or to others who have the job of specifying taper pins.

To date it has been the custom of many engineering departments to establish their own standards for precision ground taper pins based on needs for the particular products which they manufactured. This data book gives a set of standards which have become more or less universally accepted. Information in this book includes all specifications such as tolerances on the degree of taper, roundness, overall length and size. It gives users of taper pins a definite production set of standards necessary in the production to closer tolerances.

Engineers of postwar products should find these standards for precision ground taper pins a big help. Please request only as many copies as you will actually use and write to The Centerless Grinding Co., 19 Staples St., Bridgeport 1, Conn.

TOOL STEEL DRILL RODS

To point the way to better results where drill rod is used for small precision tools or intricate parts, Carpenter has published a new 24-page booklet on tool steel drill rod. It gives useful information on the selection of tool steel drill rod, heat treatment and complete tables of standard sizes. Designed to simplify the selection of tool steel drill rod and help prevent costly accidents in hardening, this Tool Steel Drill Rod Booklet is available from The Carpenter Steel Co., 314 W. Bern St., Reading, Pa.

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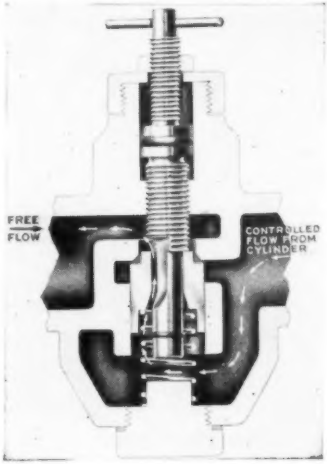
SPEED CONTROL VALVE

To provide an unlimited range of selectivity in the volume of air, thereby giving split-second control of the piston speed, is the purpose of the Ross Speed Control Valve, recently announced by Ross Operating Valve Co., 6480 Epworth Blvd., Detroit 10, Mich.

As explained by John Sainsbury, Gen. Mgr., flow of air from the cylinder to the operating valve is regulated with precision, and in either small volume or large volume, with changes taking place with smooth progression, rather than a series of "steps".

As shown by the cut-away view, both the principle and construction are very simple. There are but two moving parts—stem and poppet—with the stem so shaped as to form a venturi for the passage of air in small volume. As the threaded stem is turned downward from a closed position, incoming air in small volume is allowed to pass thru the venturi into the outlet passage, increasing in volume as the stem is lowered. Continued turning of the stem causes a flange on stem to open the poppet, permitting further increase in volume to full flow. Return air is at full flow.

Detailed information is given in a new bulletin.



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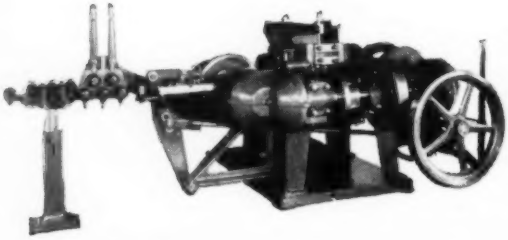
THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON *Machine Co.*
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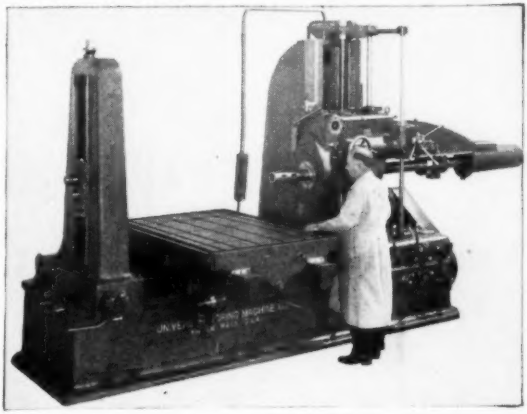
UNIVERSAL MILLING, DRILLING AND BORING MACHINES



The Universal Boring Machine Co., Hudson, Mass., now offers new 4" Spindle Horizontal Table-Type Milling, Drilling and Boring Machines with a speed range of eight to 1000 rpm, and 5" Spindle Machines seven to 850 rpm.

These machines are offered with this selection of ranges:

36", 48" or 60" Vertical Range;

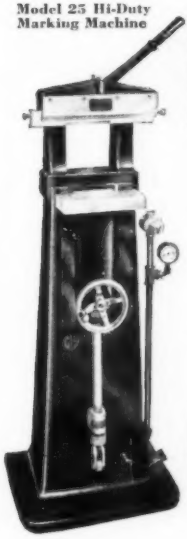
72", 96" or 120 Face Plate to Outer Support;

40" x 60", 42" x 72", or 48" x 84" Tables.

Electrical equipment includes a 20 hp Motor, which is controlled thru a swinging type pendant push button, giving Forward, Forward Jog, Reverse, Reverse Jog, and Stop.

Anti-friction bearings are provided thruout the speed gears, and all gearing and shafts have been redesigned for heavier loads.

Model 25 Hi-Duty Marking Machine



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The economy of rolled markings is self-evident, due to its speed and ease of operation, and Hi-Duty machines are designed by us for practically any marking operation. Have you a tough marking problem? Send us prints or samples of parts to be marked—showing lettering, location and required production—We will be glad to make recommendations.

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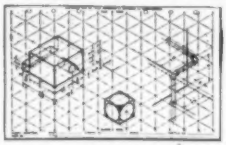

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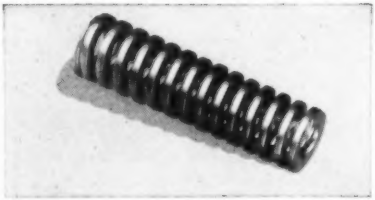

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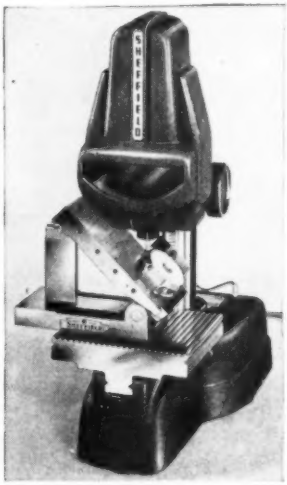
SINE BAR FIXTURES

The Sheffield Sine Bar Fixture is a device for checking tapered and angular work which requires a high degree of dimensional accuracy. It consists of a serrated work surface hinged to a base plate, the entire fixture being precision made to a tolerance of .0001". The work surface angle is set by using precision blocks as a reference.



Sheffield 5" sine bar and Sheffield visual gage checking angle of a flange.

The Sine Bar Fixture is available in two sizes, 5" and 10", respectively, between hinge center and setting bar center. The 5" fixture may be used on a Shef-

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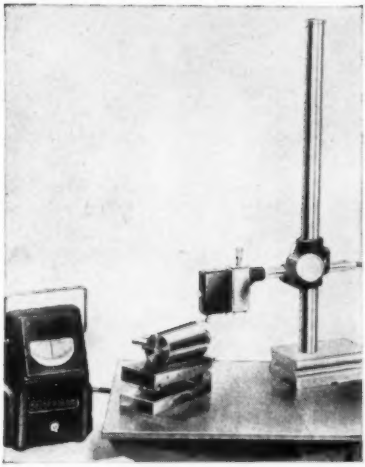


Sheffield 5" sine bar and electrigage height gage checking a large tapered plug.

field Visual Gage equipped with a 6" anvil as shown. Either size fixture is suitable for use on a surface plate with a height gage.

An adjustable work stop which may be used on either end of the fixture, and an adjustable backstop usable on either side of the surface plate, are standard equipment.

The Sine Bar Fixtures, Visual Gage, and Height Gage are made by The Sheffield Corporation, Dayton, Ohio.

PIERCING SHEETS AND PLATES

A new Bulletin 51 describes the Wiedemann R-5 Turret Punch Press in detail. This machine is adapted for short run piercing of outlet boxes, conduit boxes, metal enclosures, panels, sheet and plate work. Also included, is the R-5 machine, built for the special purpose of piercing copper bus bar.

Bulletin 51 thoroly and clearly describes the Wiedemann R-5, its construction details, applications and inherent advantages. The illustrations, close-ups and drawings are shown in such a way as to leave little for the imagination.

A copy of Bulletin 51, describing the R-5 Turret Punch Press, will be sent upon request to Wiedemann Machine Co., 1831 Sedgley Ave., Philadelphia 32, Pa.

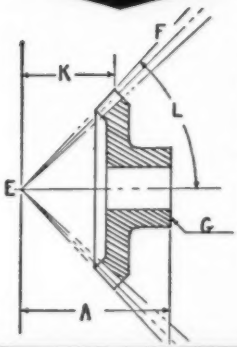
Here's the Problem

...and here's the Answer

EASY BEVEL GEAR GAUGING

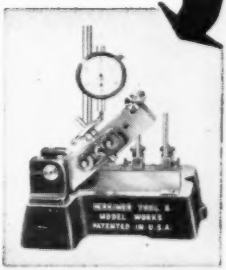
No Long Calculations

No Involved Set-up



With Herkimer sine bars and bevel-gear gauges, anyone with ordinary gauging experience and ability to read blueprints can quickly and accurately check all important bevel gear dimensions and relations. Production gauging made easy.

Write for Free Copy of Bulletin 100



HERKIMER TOOL & MODEL WORKS, 108 King St., Herkimer, N.Y.

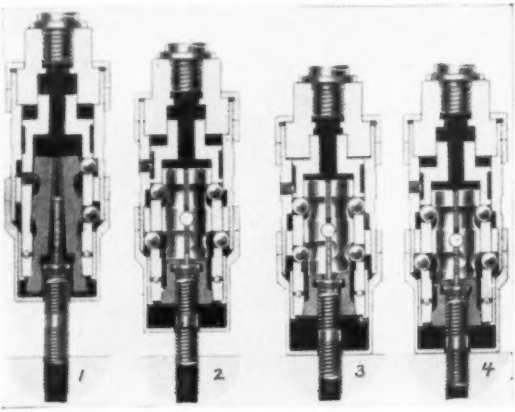
HIGH SPEED STUD DRIVING

The illustration shows four stages in the high speed driving of a stud. The driving device is a Titan No. 100 series, made by Titan Tool Co., Fairview, Pa.

The left hand figure 1 shows the tool prior to loading. No. 2 shows the tool with jaws locked in full register on the stud by upper balls, but without lower driving in positive driving position.

No. 3 shows the tool in positive driving position with driving balls pulling jaws up into taper nose bushing. Stud is partially driven to depth.

No. 4 shows stud driven to proper depth and drive balls are again in free position, but with jaws still locked in full register as in figure 2. The jaws open up when the tool is lifted off to drive the next stud.



A distinctive feature of the Titan "100" is incorporation of an automatic take-up to compensate for wear on the jaws. As threads in the jaw become worn, action

THREAD MILLING

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of the driving balls on the jaw drive shoulder tend to pull the jaws up in the taper nose bushing—causing them to close in on the stud.

The makers emphasize that these sturdy drivers were designed especially to eliminate marking of the stud threads—and they have been particularly successful in the case of cadmium plated studs.

In operation, the four upper locking balls lock the jaws in full register with the stud before any driving force is applied. At this point, the tool can revolve with the exception of the jaw, ball bearing nose bushing and the stud. After jaws are locked in position, the tool is free to come down into positive driving position, the two lower balls doing the driving directly on the jaw. After stud has been driven to its proper projection height, the cycle reverses and all driving force is removed from the jaws before they are unlocked from the stud and ready to open.

Where it is desirable to limit the amount of torque applied to the stud during driving, as in driving shoulder studs, the No. 100 series controlled Drive Stud Driver should be used. This tool embodies an adjustable over-running clutch permitting stud to be driven to any predetermined torque.

Four sizes are available for Nos. 101, 102, 103 and 104 studs. Bulletin No. 100 gives full details.

AUSTIN KEY-TYPE ARBOR

A new quick-action key type arbor has been developed by Austin Tool Works, 20 E. Jackson Blvd., Chicago, Ill. It has many possible applications altho intended primarily for use on pulleys, gear blanks, sheaves, etc. One hole is made first and machining performed with the work mounted on the arbor. The makers emphasize that it has many advantages over conventional methods of holding such as collets, press-on arbors, split bushings, etc.

Sturdy and simple in construction, the locking action is accomplished by an ec-

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PRODUCTION JUMPER

Builders hand operated "T" Grinder ups production, puts money in your pocket. Though small in size it takes big jobs in its stride . . . grinds dies, tools and parts up to 4" wide, 8" long and 10" high with accuracy and excellent finish. Releases expensive automatic machines for long run jobs.

Prompt delivery
Send for Bulletin 644

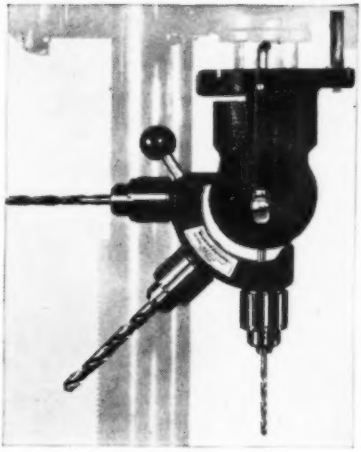
BUILDERS IRON FOUNDRY
21 Codding St.
Providence 1, R.I.

centric which raises and lowers the key. A quarter turn with a wrench suffices to lock or release the work pieces. The arbor and locking key are rugged in design and will withstand severe shocks. There is ample holding power, even when using a maximum number of cutting tools on the work. There are only two moving parts and both of these are of all solid construction. The arbors can be used for round, square or hex holes involute splines, straight splined holes and round holes with one or more key-ways.

UNIVERSAL'S TURRET HEAD

Universal Engineering Co., San Diego, Cal., has redesigned its drill press turret head to give rigid and accurate service. It incorporates semi-automatic single action indexing of the quadrant. Automatic engagement or release of clutch mechanism is controlled by raising or lowering of drill press feed lever. Thrust and radial load is carried thru pre-loaded sealed ball-bearings. Load is carried directly by the turret head itself and is not transmitted to drill press spindle.

All parts are interchangeable and precision made. The new turret is now manufactured in sizes to fit any standard drill press; whether equipped with Morse Tapers or Jacobs chuck spindles. The turret itself has Jacobs chucks as standard equipment on all models and sizes.



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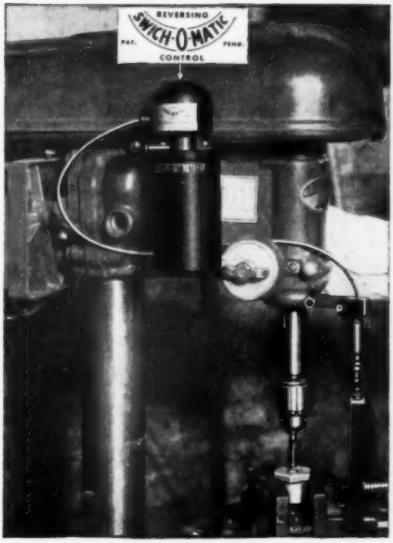
ACCURATE BUSHING CO., 440 North Ave., Garwood, N. J.

REVERSING CONTROL

A new "Swich-O-Matic" control has been developed by Read Machine & Tool Co., 2000 Santa Fe Avenue, Los Angeles 21, Cal. It is adaptable to all industries, where automatic motor reversing operation of machinery is essential, and is intended primarily for drill presses, engine and turret lathes—particularly for spindle reversing operations requiring specific tool travel or feed tolerances.

It is claimed to increase machine production by permitting the threading of non-ferrous metals and plastics at higher speed—also, to reduce operator fatigue on machine threading operations and to minimize tap breakage. Easily installed, it can be moved from one machine to another in a few minutes and does not require any special switch wiring. Can be operated automatically or manually without interfering with machine set-up. Machine may be stopped manually at any position of tool travel and re-started without altering accuracy of cut under automatic spindle reversing control.

Precision of tool travel under automatic spindle reversing control is stated as .002" travel of lathe carriage when reversed. The device speeds thread chasing



CUT ANY SHAPE BETTER with BEVERLY Throatless SHEARS

The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

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THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

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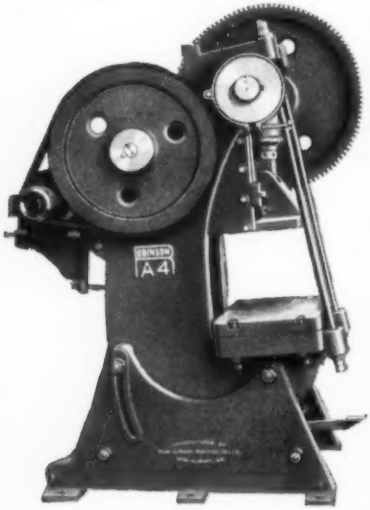
for durability strength and service



● The new improved Series A Robinson Punch Presses retain all the sturdy characteristics of their predecessors with added safety, speed, strength and ease of operation and maintenance. Available in five sizes.

Send for descriptive Bulletin No. 7.

New Albany Machine Mfg. Co.
New Albany, Indiana, U.S.A.

ROBINSON
Inclinable
PUNCH PRESSES

operations—particularly recessed thread cutting with single point tool. In this, the cable clamp is set at the desired reversing position on lathe bed. One forward pass of cutting tool is made to form the first thread cut. After carriage has been automatically reversed to a position of one turn of the work in the thread form, lathe is stopped. The operator with hand tension on carriage wheel to take up reverse slack on gear train and half nut, releases tension on the lead screw adjustment nut and adjusts point of cutting tool position to exact center between threads on machine part. He then retightens and locks lead screw adjustment nuts. As a result only a progressive forward feed of the cross slide is required after each pass of the cutting tool. A bulletin is available giving full details.

ARO MIDGET SCREW DRIVER

The newest addition to the Aro line of pneumatic production tools is the Midget Pneumatic Screw Driver, Model 7000, manufactured by The Aro Equipment Corp., Bryan, Ohio.

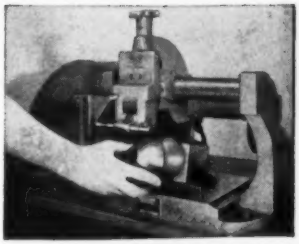
This new tool, said to be the first power screw driver designed especially for driving small screws, is about the size and shape of the average cigar. Its capacity includes screws from No. 1 to No. 6. It weighs only 8 ounces and is only 4-7/8" long and ¾" in diameter.

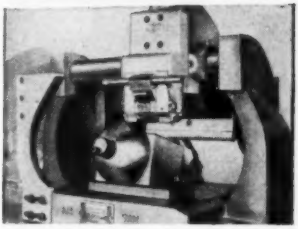
It is fully automatic with no manual throttle. It starts automatically when tool is applied to the work. It adjusts itself to every driving condition.

It has rotary type motor, 4-blade con-

struction, ball bearings thruout, hardened and ground steel rotor and cylinder. Air consumption is negligible. Its simple construction contributes to long life. It is considered fool-proof in operation. The tool is also available with adapter socket for nut setting. Finder and bits are easily interchanged for the various size screws. Tool is chrome finished.

The makers report that in extensive tests by manufacturers of radios, cameras, electronic instruments and controls, electrical appliances and other products, this new Aro Screw Driver has shortened assembly time and improved efficiency on operations where small screws or nuts are driven.





MARKING SPHERICAL PARTS

A new Acromark unit combines serial numbering with repeat marking. With this new fixture half spherical, spherical and cup shaped steel and other metal, also plastic parts can be marked. It also accomplishes consecutive numbering and repeat marking in one operation.

This unit for assembly in Acromark Series 9A and 9AM Marking Machines consists of a geared mandrel fixture with a form mounted on the mandrel to fit and hold the cup shaped part to be marked. The unit is tilted to bring a horizontal marking position directly underneath marking head which is adjusted by

ALMOND...

Triple Jaw **DRILL CHUCK**

The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole — to fit all machine tools and portable tools.

Write for complete details.

The Original Manufacturers of Drill Chucks

T. R. ALMOND CO.

ASHBURNHAM, MASS., U.S.A.

Janette

Speed REDUCERS

For SLOW SPEED DRIVES

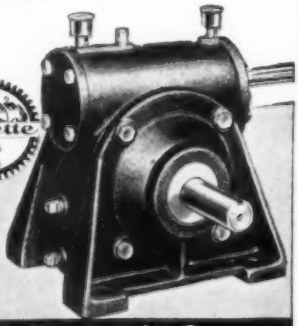
1/50 to 7 1/2 H.P.
.08 to 1140 R.P.M.

For over 36 years Janette has been building high quality machinery under the guidance of the founder of the company. We are small enough to be flexible and are able to take a personal interest in the individual requirements of our customers.

The World Wide Reputation of Janette Electrical Machinery for reliable performance is, we believe, the equal of any company, large or small.

FOR THE MOST VITAL and IMPORTANT INSTALLATIONS You Can Safely RELY ON JANETTE SPEED REDUCERS!

Ask for BULLETIN 22-27



Janette Manufacturing Company
556 W. Monroe St. Chicago 6, Ill.

a hand knob on machine itself for marking depth.

A numbering machine for automatic advance is mounted in marking head and in the oversize frame of the numbering machine, both before and after the numbering wheels; mortises for insert dies are placed for repeat marking. These inserted dies are interchangeable and are held in position by set screws.

At each horizontal stroke of the marking machine, an angle attachment pushes down the consecutive action lever of the numbering machine.

A rack gear is mounted to the rear of marking head to mesh with the gear on end of mandrel shaft to insure synchronous rotation of part being marked with horizontal movement of the marking dies.

The geared mandrel is mounted in roller or ball bearings, whichever are best suited to the pressure requirements, for free and easy marking action.

Complete details are available from The Acromark Co., 15 Morrell St., Elizabeth 4, N. J.

ELECTRONIC BORE GAGE

A new electronic bore gauge utilizing direct contact to measure the diameter of tube, gun and other cylindrical interiors with an accuracy of one-half of ten thousandths of an inch, will be introduced soon by the Chrome Gauge Corporation, Philadelphia, Pa.

The new gauge, comprising a projection rod mounted on a stabilized frame and containing a delicate, flexible point, is inserted into a bore where it checks by contact all interior surfaces. The results of the test are transmitted instantaneously to a Brown ElectroniK precision indicator. This instrument, featuring continuous balance, picks up and indicates

various imperfections, air pockets and other unwanted conditions to .00005".

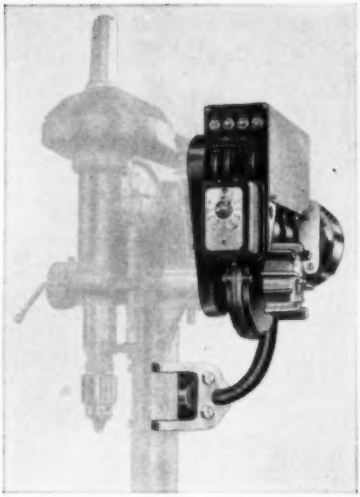
The new device is expected to be marketed in the chemical, petroleum, metallurgical and other industries that either manufacture or make use of tubes and pipes, and for processes where pipe and tube interior surface imperfections affect the process and product.

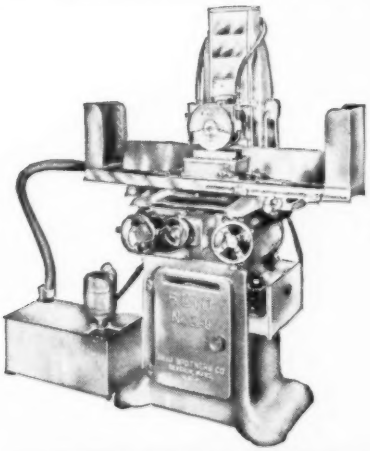
PRE-SELECTRIC POWER FEEDER

The Pre-Selectric Power Feeder made by James H. Knapp Co., 4921 Loma Vista Ave., Los Angeles, Cal., automatically duplicates the operations of a skilled mechanic when deep drilling or tapping small holes, providing automatic chip clearance at preselected depths during the drilling or tapping operation.

The machine mounts by a bracket on drill press column and by attaching a collet to drill press spindle feed shaft. Positioning of power feeder is governed by alignment of collet with the spindle feed shaft. Weight of unit is balanced on its support arm, no weight being added to drill press spindle feed shaft bearings.

The "Pre-Selectric" feeder will, it is claimed, consistently drill No. 50 holes thru alloy steel plate to full length of drill with substantially less dulling of drill than when controlled by hand.





REID

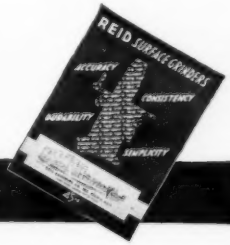
Precision

SURFACE GRINDER

EQUIPPED FOR WET GRINDING

PRECISION WITH ECONOMY

SEND FOR CATALOG TODAY!



REID · BROTHERS · CO · INC.
BEVERLY · MASSACHUSETTS

All controls are available to the operator from normal position in front of drill press. A timer is provided to control length of drilling time between chip clearances, exactly duplicating a hand drilling operation. Also shown to right of timer is a pressure adjustment knob, which sets the amount of pressure on drill, thus controlling rate at which drill is fed into work. The unit operates on 110 volt single phase or 220/440 3-phase current.

In operation the Feed provides timed, reversible, adjustable torque, with automatic start of cycle and automatic stop. When used with any standard tapping head, the unit becomes a precision automatic tapper. Tap is lifted high enough for chip clearance, but not completely removed, which is of particular advantage in blind tapping when a chip driver ahead of tap is a disadvantage. Unit is also used for honing, lapping and reaming.

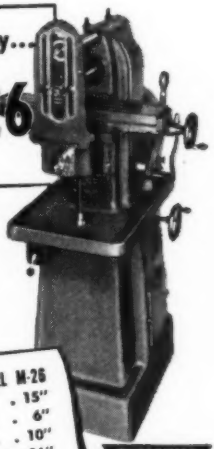
The unit permits hopper-feed of work to the drilling fixture with the operating cycle controlled by energizing a circuit thru the Pre-Selectric Power Feeder to assure proper positioning of the work, with electrical interlock. An illustrated bulletin is available.

EXPLOSIVE RIVET IRON

The Ripley Co., Torrington, Conn. announces acquisition of all Goodyear rights to the Low Voltage Riveting Iron used for setting Du Pont Explosive Rivets

When a small mill is too small and a big mill is unnecessary...

INVESTIGATE THE NEW Diamond M-26



A between-size mill, in production and tool room models

The new Diamond M-26 gives you a long-felt need—extra table travel and extra working surface—with economy that can't be matched by big machines. High production features assure rapid milling with extreme accuracy. Power is delivered to spindle with twin vee belts—quiet, efficient, non-slipping, chatter-free. Get any speed you want between 75 and 1200 r.p.m. with variable drive. Spindle rolls smoothly and rigidly on tapered roller bearings, adjustable for take-up. Automatic power feed, coolant pump and reservoir standard equipment. Full line of accessories handles all special jobs.

IMMEDIATE DELIVERY FROM STOCK

Address Dept B for quotations. Other Diamond models available.

BRIEF SPECIFICATIONS MODEL M-26

Table Travel	15"
Transverse Travel	6"
Vertical Travel	10"
Table Dimensions	5¼" x 26"

DIAMOND DTCo

DIAMOND MACHINE TOOL CO.

3429 E. Olympic Blvd., Los Angeles 23, Calif.

Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories

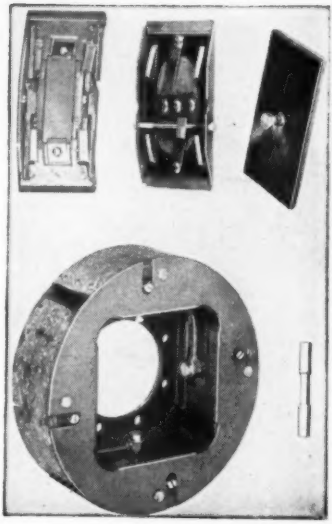
which are widely used in blind applications and hard-to-reach places.

The Ripley has also completed arrangements with the Explosives Department of E. I. du Pont de Nemours & Co., (Inc.) to produce the Du Pont No. 6 Riveting Iron. It will be sold by Du Pont for production applications.

The No. 6 Riveting Iron is designed so that upon the pressure of a trigger electric current instantly produces intensive heat at point of contact with the Rivet head. The head detonates the expansion charge within Rivet shank and sets it . . . forming a strong, tight joint.

LINDERMAN BRAKE

An industrial brake which operates on ordinary factory airline pressures and yet is declared capable of exerting as much braking effort as conventional brakes using 10 times this pressure, is announced by Linderman Devices, Inc., Newburgh, N.Y. This new brake is a development from the original Linderman heavy duty automotive brake introduced a number of years ago, but is being produced and marketed directly by Lindermen Devices instead of through licensees



ATLAS and VULCAN

UNIVERSAL JOINTS NOW IN STOCK

The ATLAS

The VULCAN

The ATLAS Universal Joint, precision made completely from heat treated Alloy steels, has been serving industry for twenty years. The Vulcan Joint for use on Hoists, Power Take-offs and similar Equipment. There is no job too severe for the Vulcan. Featuring Alloy Steel drop-forged ends and oversize grease reservoir.

WRITE FOR CATALOGS.

THE GRAY AND PRIOR MACHINE CO.

620 Windsor Street **Hartford 5, Conn.**

Our west coast Representative: Link-Belt Company, Los Angeles, San Francisco, Portland, Seattle and Oakland.

as in the case of Linderman automotive and aircraft brakes.

The entire brake is self contained. The four multistage diaphragms which actuate the shoes are interconnected to assure equalized pressure on all parts of the brake circumference. Since the shoe movement is radial only, brakes may be operated in either direction with equal efficiency and equal braking effort for a given operating pressure.

Brake shoes have heavy steel bottoms for maximum rigidity to prevent deflection. Shoe bottoms incorporate the wedge mechanism to adjust shoes for lining wear and maintain desired operating clearance between lining and drum. Shoe tops are of cast iron and contain the shoe return springs.

An idea of the capacity of the brake may be gleaned from the 14 x 4" size. On intermittent service for retarding or stopping, the brake is rated at approximately 25,000 inch lbs torque. The same brake when used as a tension device will absorb continuously from 3 to 10 hp, depending on shaft speed and cooling provided. This rating is based on drum temperatures not to exceed 475°F.

Brakes may be direct connected to existing machine shafts or may be attached by flexible couplings or by chain and sprocket drives. Altho operated under comparatively low air pressures, only a small amount of air is required to actuate the brakes, due to the extremely small volume of the multistage diaphragms when expanded.

DIE-CO CATALOG NO. 4

A new revised 40 page catalog No. 4 contains a complete line of accessories or Tool and Die Makers and Machine Shops.

Included among the items listed and illustrated are a large variety of die springs from which the die designer may select the type best suited to the requirements of the job. Each spring is a precision-made product. Charts list sizes and data pertaining to load and deflection.

Other supplies listed include many types of Socket Screws, Steel Machine Screws, "Hardsteel" Drills, Washers, Hack Saws, Band Saws, Jig and Fixture Parts and a complete line of Toggle Clamps for clamping parts in production.

Write on your business letterhead for a copy to Die Supply Co., 5345 St. Clair Ave., Cleveland 14, O.

Facing
COMET TOOLS
BORING, FACING &
INTERNAL THREADING
Boring
Int. Threading
For holes from ¼" upward, 15 different sizes.
Made of Super-High-Speed Steel Specially Heat Treated
Indispensable for your JIG BORER. The worm-like spiral of the boring heads provides a long, useful cutting surface. Their use insures perfect fitting threads. Correctly designed for precision work.
Write for Complete Data
COMET TOOL CO.
738 Broadway
New York 3, N. Y.

LAMP RESEARCH PAYS URANIUM DIVIDEND

The two-billion-dollar gamble of the atomic bomb project had to draw to many an inside straight in its race against time and the enemy. That it was successful in at least one of these can be laid to the curiosity of a Westinghouse research scientist, working in the comparative obscurity of a small laboratory at the Westinghouse Lamp Division in Bloomfield, N. J.

The link that drew the two together was the urgent need for pure uranium. All other elements in the atomic project were available: money, manpower, laboratory facilities, and a backlog of research. Lacking only was a ready supply of pure uranium—or the time to produce it. It would take months for the plants then being erected to turn it out; and each day's delay meant postponement of the bomb's achievement, and prolongation of the war.

This is where the scientific curiosity of Dr. Harvey Rentschler paid off. For the Westinghouse scientist, now Director of the Lamp Research Laboratories, had been producing pure uranium in small lots for many years before atom-splitting became a national program. In fact, all of the few tiny lumps of pure uranium available in America when the atomic project was started were produced in Dr. Rentschler's little laboratory.

He first hit the uranium trail after the close of World War I in search of a material that was superior to tungsten for lamp filaments. That the metal didn't work in this application was no deterrent to Dr. Rentschler. Using a crude but effective laboratory set-up developed along with Dr. John W. Marden, Assistant Director of the Laboratories, he continued to produce pure uranium a few ounces at a time—for further study and to supply the demands of scientific institutions who found this the one source of supply.

Then came the all-out atomic bomb program and the great need for uranium. By the end of 1942 Westinghouse had boosted production to 100 pounds daily—and still this was the only source of the metal.

In the first experimental atomic-power generator, constructed at the University of Chicago and put into operation Dec. 2, 1942, the uranium produced by Westinghouse played the dominant role. Of several thousand pounds of the precious metal used in the "pile," all but a few hundred pounds came from the Rentschler-Marden process.

NO NEED TO PAMPER THIS WHEEL DRESSER

A Carboloy Diamond Impregnated Wheel Dresser can "take it!"

Accidental abuse doesn't stop it for performance depends upon not one diamond but many . . . there's always more stones ready to go to work!

And diamonds can't come loose! A special matrix permanently grips even the smallest one throughout its entire useful life. You get up to 90% service from *each and every stone.*

A daily quarter turn of dresser in holder presents a new, sharp cutting surface and, since the entire matrix is diamond impregnated, the operation can be repeated time and again . . . another reason for long, dependable service.

Specify "Carboloy Dressers!" Just 3 sizes dress all commonly used wheels: priced from $9.60 to $15.35.

CARBOLOY COMPANY, INC.

11139 E. 8 Mile Blvd., Detroit 32, Mich.

Also Sold By Leading Mill Supply Distributors

CARBOLOY (TRADEMARK) CEMENTED CARBIDE

DIAMOND IMPREGNATED DRESSERS

TOOL KOTER

A Few Good Reasons Why You Should Protect "Precision" With "Tool Coat"

1. "Proven Performance" say many users who have already installed this modern method of protection for precision, carbide tools, gages and spare parts.
2. Cost is negligible compared with previous methods of rust proofing and wrapping.
3. Superior protection against breakage, corrosion and long time storage.
4. Simple application with newly developed "Tool Koter," readily portable, weighing only 50 lbs., engineered to meet all your tool coating requirements.
5. Low wattage, can be plugged in ordinary socket, all welded steel construction, heavy duty automatic thermostat, thoroughly insulated.
6. Price of "Tool Koter" only $67.50. Includes special heat transfer oil—ready to operate.

If you are already using this method of protection, investigate Seibert's "Tool Coat" for best results—meets all Government specifications. Prompt Delivery.

Write for details. Let us submit recommendations without obligation.

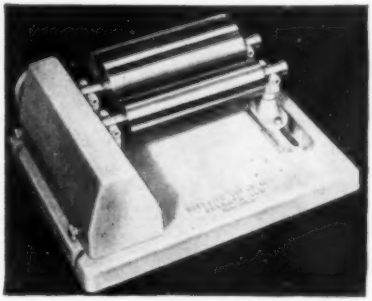
RILEY & GEEHR, INC.
ONE NORTH LASALLE ST.
CHICAGO 2, ILL.
Phone Andover 5292

NEW ENGLAND REPRESENTATIVES—
Arthur A. Crafts Co., Inc.
603 Newbury St., Boston, Mass.

ROLLER LAPPING MACHINE

A new Spitfire Roller Lapping Machine is designed to simplify and speed up the job of lapping and polishing round plugs, pins or rods. According to the makers, this new machine does the work accurately and with a minimum of rejections, turning out highly finished jobs in approximately 1/3 of the time necessary with the old "ring lap" method.

The machine consists of two precision ground cast iron rollers which revolve in self-aligning and adjustable bearings. One roller is approximately 3" in diameter x 12" and the other roller is approximately 6" in diameter x 12". Both rollers rotate in the same direction (away from the operator at the top of the rollers) at the same rpm. They are easily adjusted to accommodate work up to 6" in diameter.



The suggested procedure is to grind the plug or pin within .0002 to .0004" of the desired size and then lap to size. Abrasive compound is placed on the rollers with fingers or a brush and spread evenly over both surfaces. Work is placed between the rollers; then a notched fibre stick is pressed down on it and moved slowly and evenly from side to side across the plug or pin. If it is necessary to lap a small amount off any particular section, the fibre stick is merely kept longer on that section. Friction of the rollers on the plug causes it to revolve and the difference in the surface speed of the rollers brings about a lapping or polishing action. Tapered plugs or plugs with shoulders are handled with equal ease. "Waves" and high spots are removed from the length of the plug or rod due to the line contact of the work and the rollers.

No chucks are used. Work may be put in and taken out for checking and measurement without stopping the machine.

ENJOY THE SATISFACTION OF

Patented

SUPERB PERFORMANCE

with

ABER CURVED TOOTH MILLING CUTTERS

Maintain that width with the "Chatterless Flowing Action" of a Curved Tooth Overlapping Side Milling Cutter.

SEND FOR CATALOG

ABER ENGINEERING WORKS, INC. - Waterford, Wisconsin

Gairing TOOLS

Counterbore Sets

These handy Gairing kits speed production on all counterboring and spotfacing operations. Available in seven sets containing a neatly boxed assortment of *interchangeable* counterbores, pilots and holders. *Write today for prices and literature.*

THE GAIRING TOOL CO., Detroit, Michigan

This set consists of one Type B-2 holder, 9 cutters ranging from 3/8" to 1 1/8", 9 pilots from 1/4" to 7/8" and 2 countersinks 7/8" dia. — 70° and 80°.

Drilling Holes in Concrete—

or Cutting out old putty from around windows.

SYNTRON

DEPENDABLE

ELECTRIC HAMMERS

Will SAVE You Money every hour they're used

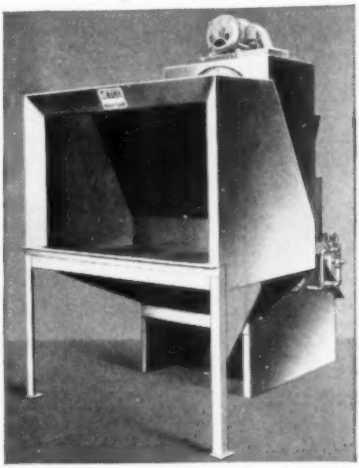
Write for descriptive folder.

SYNTRON CO. 300 Lexington Homer City, Pa.

Since excessive heat is dissipated to a great extent by the large mass of the rollers, a "cooling period" is ordinarily not necessary.

For further information, address Spitfire Tools, Inc., 2930 North Pulaski Road, Chicago 41, Ill.

METCO SPRAY BOOTH



Designed, engineered and built for handling sprayed metal dust, a complete line of Metal Spray Booths and Wet Dust Collecting Equipment has just been released by the Metallizing Engineering Co., Long Island City 1, N. Y. The line includes spray booths for exhausting to present exhaust systems, to the atmosphere, or into a Metco wet collector. Featured in the line is a lathe exhaust unit which is mounted directly on lathe carriage and moves with it. Also featured are wet collectors and water wash spray booths which gather metal particles in a sludge sump where valuable dust may be reclaimed for salvage.

Metco spray booths include advantages such as sloping rear wall that eliminates eddies and recirculation, open-type work table, down draft, dust trap and cleanout door. The complete line is described in Bulletin 43A.

"LUBRIGARD" SAFETY DEVICE

A new development in the design and construction of crank type toolroom shap-

ers, is the "Lubrigard" Safety Device, an exclusive feature of Gemco Shapers, manufactured by General Engineering & Mfg. Co., St. Louis 4, Mo.

Its function is to automatically prevent ram of the machine from being started:

1—In case oil supply in reservoir is insufficient;

2—Should pressure in system be below the minimum required;

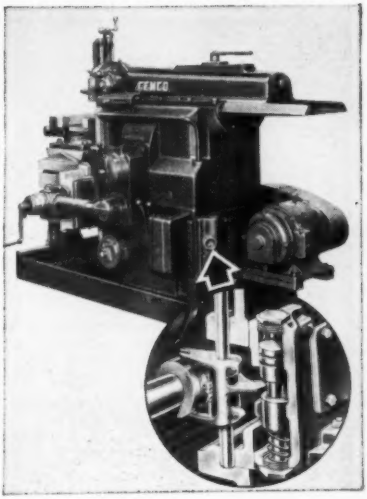
3—Should a leak or failure of the oil pressure system occur;

4—Should filter become clogged;

5—Should drive pulley rotation be incorrect.

In addition, "Lubrigard" is designed to prevent the clutch control lever from being engaged while drive pulley is at rest. Therefore, should motor be started, the ram will not move unexpectedly. This prevents possible injury to operator, or damage to machine or work piece.

A glance at sectional view of the illustration will show how the oil under pressure forces piston down, permitting projection on clutch control lever shaft to clear recess in piston, thereby allowing control lever to move into starting position.



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HAND CUT . . MILLED CUT
GROUND FROM THE SOLID
There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.
Send for Catalog WR illustrating the complete line in full size, speed charts, etc.
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New York, 13 N. Y.
IMPORTERS OF GROBET SWISS FILES
MFRS. OF GROBET ROTARY FILES

YANKEE SURFACE GAGE

The Yankee Precision Products Co., Hartford, Conn., announces a new type of automatic visual indicating electric surface gage for measuring flatness of machined surfaces to within extremely close tolerances. While size and shape of the piece being gaged determines to a certain extent the factor of accuracy, test recordings on typical pieces have indicated that variations of as little as .000005" may be measured.

In general principle, the apparatus consists of a work table with a surface formed of closely spaced rest buttons, arranged to duplicate form and area of the piece to be gaged. Tops of these buttons are accurately ground and lapped to form a flat resting surface. Each button is connected electrically to a small light bulb placed in matching position in a duplicate of the face of the gage mounted above work table and facing the operator.

In operation, work piece is laid upon surface of the gage and, in the case of perfect, over-all accuracy, all of the electric bulbs will be illuminated. Where high or low spots appear, bulbs in the equivalent positions on the duplicate work pattern will not light, and the percentage (65%, 70%, 80%, etc.) of inaccuracy will be simultaneously indicated by the electric meter connected to that segment of the gage surface.

An unusual and important feature is a special electrical circuit that eliminates danger of sparking at contact points and also assures positive "On or Off" registration right down to the extreme limits of accuracy possible with the gage. Two push buttons are provided —one for each hand of operator, to prevent shifting of work when contact is on. An "On" switch is provided for turning on current, and another test switch indicates that all bulbs are in working order. The gage is arranged to operate on 110 volts a-c current.

While this particular model is designed for use where work can be brought to and

SAVE SPACE—

Yohe Racks take less floor space—hold more stock and require less lifting. Four arm rack, 51" high stacks 10,000 lbs. Five arm rack 57" high holds 12,000 lbs. flat or round stock—at safe lifting heights. Use against wall or back-to-back in center of room.

Let us send details and prices.

WM. S. YOHE SUPPLY CO.
503 Mahoning Rd., N.E., Canton, O.

SAVE LIFTING

CUT ALL 3 PATTERNS
WITH STRAIGHT KNURLS

using Graham "Adjust-angle" Knurl Holder

Adjust the angle and change the pattern. Handles work up to 2½" dia. Shank to fit your turret. INSTANT RUN-BACK with Passing-over-stock Feature.

Request Illustrated Price Circular

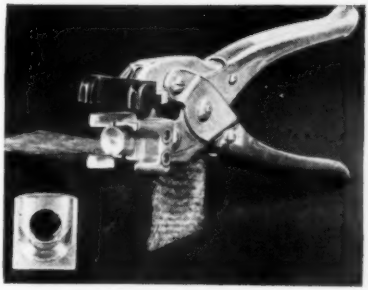
GRAHAM MFG. CO.
53 Bridge St., East Greenwich, R. I.

placed upon it, the principles involved are widely applicable to other requirements, including the use of portable plugs and to the measurement of tapered bores and irregular surfaces or contours. Since all such equipment is designed and built to meet customer's specific requirements, prices will be quoted on request accompanied by an outline of the work to be performed.

INSERT PREVENTS WEAR

A solution to the problem of providing satisfactory life of hand tools used under highly abrasive conditions was found recently on a production job in the plant of a large manufacturer of electrical refrigerators.

Here, one operation in manufacture of the pistons for refrigerators consists of burring the individual half-pistons. To do this, the work piece is held in pliers as shown. The half-piston is then pressed against a revolving brush of special construction. This brush consists of bristles with strips of "Adolox" cloth interwoven with the bristles. This combination proved to be a very active good grinder; so much so, in fact, that it was extremely destructive of the pliers where they came into contact with the revolving wheel. Pliers made from conventional materials stood up only four hours before having to be replaced.



A solution was found by brazing a Carboloy insert to the pliers on the portion which contacted the wheel. After two months of continuous service, no appreciable amount of wear could be detected. The Carboloy portion had merely been nicely polished.

FOR ACCURACY
LONG LIFE

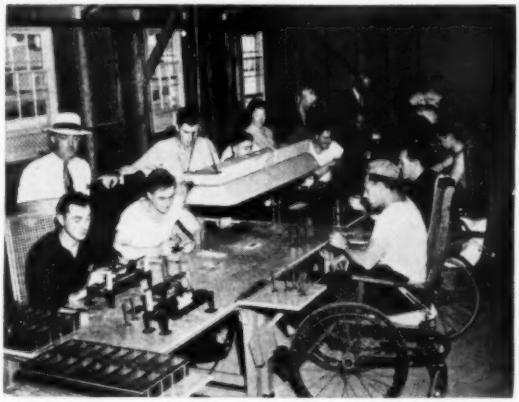
Now Available!
Stub Screw Machine Reamers
Carbide-Tipped

SEND FOR NEW STUB REAMER BULLETIN

SCHMARJE CARBIDE
REAMERS ARE GIVING
OUTSTANDING
PERFORMANCE ON SCREW
MACHINES.

Schmarje Tool and Engineering Co.
MUSCATINE, IOWA

DISABLED VETERANS LEARN PRECISE INSPECTION WORK



These veterans of World War II, altho seriously disabled in Uncle Sam's service, are reported already on the road to economic rehabilitation, thanks to the use of precision measuring instruments made by Federal Products Corp., Providence, R. I.

The veterans shown are wheel chair patients at "Valor", a unique plant, located at the Percy Jones General Hospital Annex, at Fort Custer, Mich. The plant is completely equipped with gages, indicators, comparators, and the latest fluorescent lighting system.

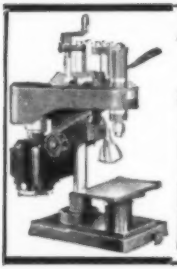
Here men who have suffered severe spinal injuries, learn to become industrial inspectors in a very short time. They are shown checking the precise dimensional measurements of airplane engine valves, and using Dial Indicating Gages.

At "Valor", a name which by the way is taken from Vocational Activities Liaison of Rehabilitation, these inspectors-to-be, work for two hours in the morning and two in the afternoon. The "Vets" use regular time cards and, of course, receive pay checks from the Eaton Mfg. Co. for all work done during their training periods. The "Vets" have responded enthusiastically to the opportunity to thus fit themselves for precise work as industrial inspectors. As one official puts it:

"Just to see the fellows brighten up, to be cheerful and busy again is worth every effort that has been expended."

Specially constructed inspection benches enable the "Vets" to get their wheel chairs up close to the instruments and thus keep fatigue down to a minimum.

Of course, by making use of modern, scientifically made Dial Indicating Gages for the inspection work, the "Vets" can become proficient in industrial inspection in very much shorter time than they would be able to do without such instruments. It is not necessary for the men to develop a fine sense of "feel" as is called for, when for instance, micrometers are used for inspection work. By using Dial Indicators, the "Vets" are able to see the exact dimension on the Indicator Dial, which is as easy as telling the time on a clock. The Dial Indicator Gages record any variations from the specified dimensions, and magnify this visually on the Indicator Dial. The tediousness which



A RADICAL DEPARTURE
BETTER FIND OUT "HOW AND WHY"

Hamilton
"Varimatic"
Super-Sensitive
Drilling Machine

Infinitely variable speed, sensitivity, ease of operation and super-performance — "instrument precision" — in drilling . . .

HOLES FROM .004" to 5/16" dia.

Write for Bulletin to Dept. 14

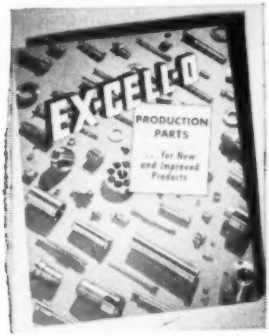
THE HAMILTON TOOL CO.
HAMILTON, OHIO

goes with repetitive mechanical operations is reduced to a minimum by the use of the Dial Indicating Gages. The value and practicability of this rehabilitation work has already been demonstrated and as a result, consideration is being given to extending the experiment to bed ridden "Vets".

EX-CELL-O PRODUCTION PARTS

An informative folder describes Ex-Cell-O's facilities for manufacturing production parts and unit assemblies. Of special interest are its graphic interior photographs of Ex-Cell-O's production departments, showing the machinery used in parts output.

Ex-Cell-O's services and facilities for making miscellaneous production parts were greatly expanded during the war. New machinery and techniques were developed to make possible quantity output of quality parts. Now, this same organization, equipped with the "know-how" that gave Ex-Cell-O an outstanding war record, is available for mass production of accurate parts and sub-assemblies for peacetime products.

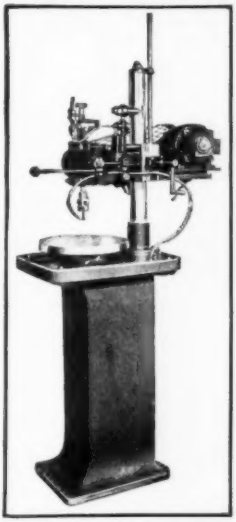


As described in the folder, Ex-Cell-O is equipped to handle parts from rough stock to finished pieces. Engineering, machining, heat treating, grinding, sub-assembling, and inspection are all performed under one management. One of the nation's largest manufacturers of machine tools and cutting tools, Ex-Cell-O has more than 2000 pieces of equipment to carry out these operations.

Copies of Ex-Cell-O's "Production Parts" folder (Bulletin 36151) may be obtained by writing Ex-Cell-O Corp., 1200 Oakman Boulevard, Detroit 6, Mich.

Precision . . . .

TAPPING



Leads changed in 90 seconds

M & L

PRECISION TAPPER

This is a fast rugged production tool capable of sustained accuracy. Flexible and adaptable, it cuts clean screw threads, handling up to ¾" in non-ferrous metal and 0 to ½" in SAE steel. Class 3 and Class 4 gage fits and high production schedule are accomplished in normal operation even with unskilled help.

Tapping speeds are 95 to 350 rpm with reverse speed twice that of forward speed. Taps are guided by precision ground lead screws which are easily and quickly changed. Bulletin 143 gives full details.

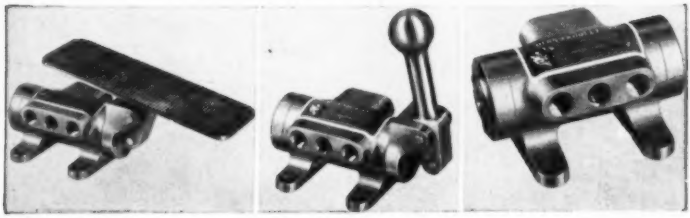
Dealers' inquiries are invited

LECKINGER

MACHINE AND EXPERIMENTAL CO.

716 N. Highland Ave., Los Angeles, Calif.

"MODERNAIR" 4-WAY CONTROL VALVES



"Modernair" 4-way control valves, known as the Model CV Series, have been announced by Modern Products, Ltd., 952 So. Grand Ave., Los Angeles 15, Cal. Designed for the control of air and low pressure hydraulic systems, the valves are adapted to hand, foot or pilot operation by simple assembly changes of identical housings. (Shown in illustration, left to right).

The valves are fully balanced, use aircraft type packing and are free from metal-to-metal contact between wearing parts. The design permits transmission of full line volume and pressure thru the valve, without operation of the valve being affected by variation of line pressure.

Design of valve permits its use normally "on" or "off" in three positions, with center position being "neutral." In "neutral" position, when valve is used for cylinder control, the unit may be arranged to permit positioning of piston with pressure balanced on both sides of the piston, or with pressure relieved at both piston ends. All of the adaptations as hand, foot or pilot operated valves can be used as single 3-way valve by plugging one outlet port or as two 3-way valves in series. When unit is installed as two 3-way valves in series, one valve will have the pressure on, while the other will have the pressure off.

Valves are normally furnished with 3/8-18 NPT Female ports at 1" spacing on centers. Valves are also available in 3/4"-18 port size, with other sizes contemplated for the near future. Mounting pads are 4-3/8" overall with 9/32" diameter holes on 2-13/16" centers. Width of valve body, port facing to port facing, is 3⅛". Overall width of body is 2-7/16". Addition of the handle increases overall height to the maximum point in the handle arc to 6¾" by an overall length of 7-5/16". Use of foot increases the overall length to 10-⅛" by 4-11/16" to the maximum height reached by the foot treadle.

"OLIVER"
No. 192
Most Complete BAND SAW on the Market

Easily cuts sheet steel (⅛" and under) and other sheet metals, tubing, rods, etc.

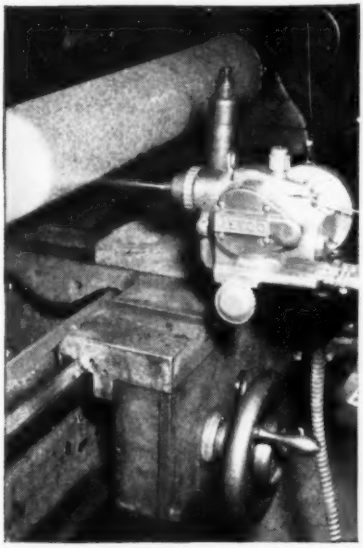
This versatile unit handles work 18" between saw and column and 9" high under upper guide. Uses saws up to ½" wide cuts circles, irregular curves and straight. Table tilts 45° to the right. Precision built thruout.

OLIVER MACHINERY CO.
GRAND RAPIDS, MICHIGAN

METCO TYPE "Y" GUN

The Metallizing Engineering Co., 38-14 30th St., Long Island City, N.Y., announce a new metallizing gun designed for heavy-duty, continuous operation. This unit, known as the Metco Type Y Metallizing Gun is the result of an increasing demand for a metal spraying gun that could be used for production and other heavy duty metallizing jobs instead of just for intermittent operation.

Unlike the hand gun, it is designed specifically for mechanical mounting and continuous operation. Its many outstand-



ing features include the use of 3/16" wire, —a revolutionary "first time" which, when combined with an acetylene pressure of only 15 psi more than doubles any previous spraying speeds.

Gears, worms and bearings are several times larger than any used previously, virtually eliminating wear and replacement.

A built-in forced feed pump which has no parts to wear assures an adequate supply of lubricant to all bearings regardless of operation position. The gun is non-sensitive to gas and oxygen pressure variations as much as 10 pounds either while lighting or while spraying. These and other features are described in great detail in Bulletin 49P.

TOWNSEND RIVETING MACHINES

A new 6-page bulletin illustrates and describes the Townsend line of riveting machines. Specifications, information on operation of machines and complete charts for ordering parts are included. Copies are available from The H. P. Townsend Mfg. Co., 5 Chestnut St., Hartford 1, Conn.

SMITH MASTER PLATES FOR THAT TOUGH JOB

Smith Master Surface Plates have become the standard for precision measuring equipment in hundreds of plants. Manufacturers who want a superior surface plate, offering maximum rigidity and stiffness with a minimum distortion and precision accuracy to 0.0001", will find Smith Master Plates very much to their liking. There is a Smith plate available to meet your requirements. Write today!

SMITH TOOL & ENGINEERING CO.
855 N. Sandusky Ave., Bucyrus, O.

ANNOUNCING
New Line of
OIL GAGES

FEATURING—

- **UNBREAKABLE PLASTIC SIGHT**
- **UNLIMITED VISIBILITY**
- **STURDY CONSTRUCTION**

AVAILABLE in a complete range of sizes and styles. The simple construction eliminates hazards and cost of breaking glass. Special height and length gages can be furnished.

IMMEDIATE DELIVERY

OIL-RITE CORPORATION
3474 S. 13th Street Milwaukee 7, Wis.
Manufacturers of Lubricating Equipment
Sight Gravity Feed Oilers — Oil Cups—
Constant Level Oilers — Wick Oilers

DOWEL PINS

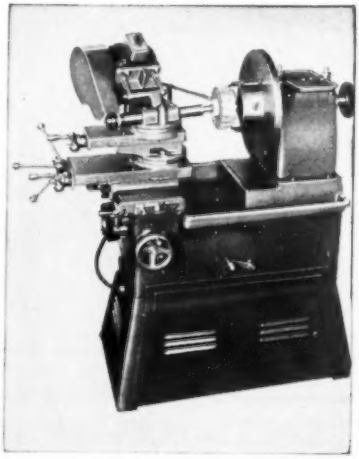
Immediate Delivery!

Standard Size Dowel Pins from 1/8" to 1" diameter and from 3/8" to 6" length supplied in .0002 and .001 over basic sizes. Unless otherwise specified, .0002 oversize will be furnished.

SCHULTZ & ANDERSON CO.
109 Edison Place, Newark 5, N. J.

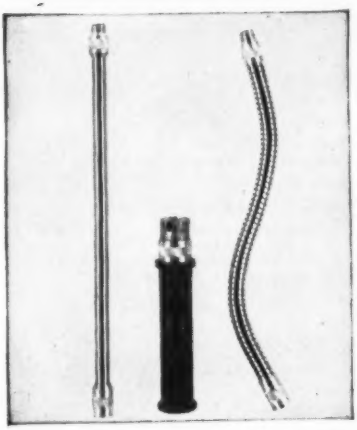
LEMPCO ACX GRINDER

The new design of the Lempco Model ACX Multi-Purpose Grinder has the wheel-head mounted on two different compounds, each graduated to 180°, thereby permitting difficult internal or external taper grinds or turns to be easily and accurately done.



Another important new feature is that the workhead can now be moved 6" toward or away from work, by simply removing and replacing just four screws. By so doing, the swing can be increased from 18" to 30", greatly increasing the number of jobs which this very versatile machine can handle. It has both hand and power cross-feeds, work length capacity up to 8", and two reversible spindle speeds of 80 and 130 rpm. Chucks are quickly and easily mounted on the face plate by a draw bar which extends thru the spindle. Wheel-head has a two hp motor with ball bearing spindle, and speeds of 6,000 and 12,000 rpm. A retractible tool holder bar enables finished grinding to follow turning operations without removing cutter. The power cross-feed can be set to any desired length by dogs on side of carriage. Longitudinal feed is controlled by a quickly interchangeable screw or rack and pinion. An automatic sizing device insures exact duplication of successive pieces on production runs.

FLEXIBLE PROBE MAGNETS



George W. Hamilton Associates, Evans Building, Washington 5, D. C., announce permanent magnets of flexible probe type. These are designed to probe for and extract from inaccessible locations, screws, bolts, nuts and other parts made from magnetic materials. Complete interchangeability is assured by standard screw connections. Rigid extension may be used either with or without flexible extension; magnets may be affixed to handle and used in short probing distances. Magnets are assembled in brass threaded receptacles. They can be remagnetized when necessary at a small cost.

STANDARD ISSUES BULLETIN

A new four-page folder B2 published by The Standard Electrical Tool Co., 2486 River Road, Cincinnati 4, O., describes in detail their infinitely variable speed Buffing and Polishing Machines now available in sizes from one to 15 hp. The "Speedial" control instantly reflects any spindle speed change from 1500 to 3000 rpm to permit both buffing and polishing on the same machine at the required speed—and furthermore, as wheels reduce in diameter, the peripheral speed may be maintained by increasing the spindle speed.

Now Welders Can Spend Their Time Welding

Without C-F Positioners, much of the time consumed in the fabrication of large weldments is *handling time*, time spent lifting, flopping, and propping up weldments into position for each new pass. Added to each hour of actual welding time is the cost of crane time, sling crews, and above all, continuous interruptions and delay.

How different where C-F Positioners rotate great weldments under push button control. Here welders can spend their time welding—welding all sides and all angles as they should be welded "down hand."

There are C-F Positioners in capacities from 1200 lbs. to 30,000 lbs. Manual or motor driven.

Write for Bulletin WP-22

C-F POSITIONERS

CULLEN-FRIESTEDT CO.

1321 S. Kilbourn Avenue **Chicago 23, Ill.**

It's EASIER and FASTER with an AUSTIN Key Type Arbor

The Austin is used primarily to eliminate arbor pressing and colleting where work is machined from the hole.
A quarter turn of a wrench tightens or loosens work pieces, yet arbor has great holding power with a maximum number of cutting tools on the work.
Arbor is simple in construction—only two moving parts and built for strength and durability.

AUSTIN TOOL WORKS

20 EAST JACKSON BLVD.
CHICAGO 4, ILLINOIS

PULSING CONTROL DRIVE

Yardeny Pulsing Drive provides single knob precision control of any type of reversible motor. Direction and extent of motor motion are under complete control of the single knob. Motor may be continuously rotated or moved in small increments—easily and accurately.

Slow clockwise rotation of control knob results in a corresponding motor motion in small increments. Slow counter-clockwise rotation of control knob causes reverse motor rotation in small increments. Either permits the controlled mechanism to be spotted with a high degree of accuracy.

Rapid rotation of control knob causes faster motor motion and more extended travel. Therefore, the very important features of fine and coarse control are incorporated in this single knob control.

By depressing knob and turning the knob slightly right or left, continuous forward or reverse rotation of motor can be accomplished.

The Drive works on all standard currents and frequencies. The extent of fine and coarse control provided by the unit can be made to suit every purpose in a manner that permits quick approach and precise positioning of the controlled object.

The Drives are suitable for inclusion in all existing controlled motor devices and offer many advantages that recommend it for new design projects. Recommended applications include precision

NEW AIR-SPEED SAW and FILE cuts TIME cuts COSTS cuts PERFECTLY

Dependable pneumatic power saw and file—Weight: 3½ pounds—Operating speed and cutting stroke easily adjustable—Nothing like it for key hole, dead-end and scroll cutting in iron, steel, aluminum, copper, plastics, brass, wood, hard fibre and other materials—File can be inserted in chuck, instead of saw blade, for all filing operations—Only two moving parts guarantee long life—Fully warranted—Retails for $39.50—Immediate deliveries—See your Jobber.

AIR-SPEED TOOL COMPANY
1028 W. Slauson Ave., Los Angeles 44, Cal.
Dept. MTBB-1

Air-Speed for difficult sawing or filing jobs!

control of valves, cranes, lifts, rollers, presses, machine tools, mixers, etc., in fact any motor driven equipment requiring more precise and more flexible control than afforded by ordinary push-button methods.

It is a product of Yardeny Engineering Co., 105 Chambers St., New York 7, N.Y.

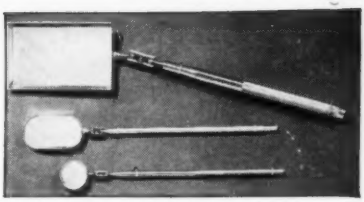
MECHANICS' MIRRORS

Most mechanics, tool and die makers, machinists, automotive mechanics — in fact, mechanics in every field use some mirror in their work.

Usually the mirror is a salvage job from some woman's discarded pocketbook. Frequently the mirror is adapted from some other field of endeavor. For example, dentist's mirrors are in wide usage.

Recognizing the many needs that could not be fulfilled by this make-shift improvising, the Ullman Products Co., 857 Fourth Ave., Brooklyn, N. Y., manufactures a complete line of mirrors which are mirror tools and can be applied to most requirements in the industrial field.

While the manufacturer calls the products "inspection mirrors", he points out that this is a misnomer—they are mechanics tools and should be rightly named Mechanics' Mirrors.



These mirrors are not used for purposes of inspection only. The truth is that they are used primarily as an Extra Eye to give vision in the 1001 blind spots with which every mechanic must contend. Thru extensive field testing and revision of earlier models, the manufacturer now features three models.

BEG YOUR PARDON

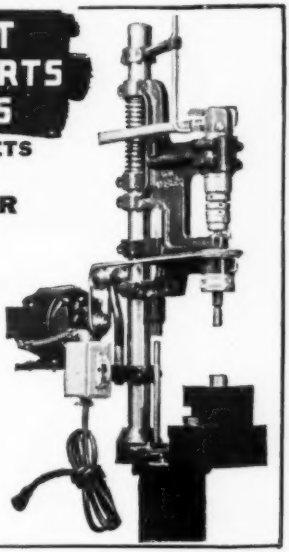
On page 403 of the November BLUE BOOK the Fonda Gage Co., Stamford, Conn., announced their Data Sheet TC-1, describing Tungsten-Carbide Gage Blocks. It was stated that these blocks are available in sizes from .001" to 4.000". This naturally should have been .1001" to 4.000". Our apologies to the readers and to the Fonda Gage Co.

NOW YOU CAN RIVET UNSUPPORTED PARTS OR ASSEMBLIES

OR COLD-HEAD LONG SLENDER RIVETS with an

AIRFLEX SPINNER RIVETER

Through a new method of peening the Airflex Riveter allows a greater scope in cold-heading of long slender rivets, independent of support from the assembled parts.
It permits the use of a wide range of rivet materials—less ductile rivets such as stainless steel and free turning brass, may be used effectively.
The Airflex is especially practicable for riveting to fragile materials such as plastics, wood, fibre, glass, ceramics, enameled wear, insulating materials—all types of cold headed assemblies.
Full tight heads are assured.
New features include—fully controlled spindle, interchangeable hammers-fully adjustable.
Look into the possibilities of using the Airflex for your riveted assemblies. Plymouth Engineers will gladly help you solve your production riveting problems. Studies made without obligation. Send full details, blue prints or sample assembly.



PLYMOUTH ENGINEERING COMPANY

Manufacturers of

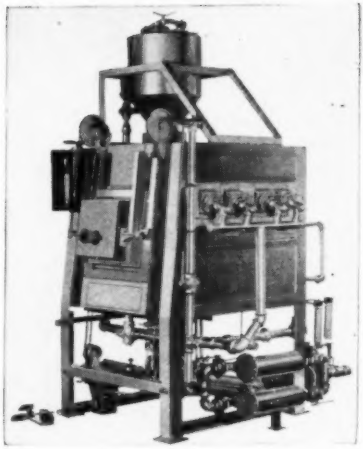
Kern AIRFLEX Equipment

Plymouth, Indiana

DUAL PURPOSE FURNACE

For increased flexibility in handling different batch type heat treating operations, a new atmosphere muffle furnace is offered by Surface Combustion Corp., Toledo 1, O. Due to a new feature of design, the furnace can produce the proper atmosphere for gas carburizing, yet also is applicable for general heat treating. In addition, all the features of "Surface" Char-Mo heat treating furnaces, including atmosphere and uniform temperature distribution are provided.

For rapid heating the furnace is equipped with over-muffle and under-muffle burners. The time to temperature ranges from 2½ to 3 hours. The furnace is available in three sizes, for light or medium batch operations.



The furnace utilizes a selective double door to facilitate handling pieces of various sizes with least loss of atmosphere. The inner door has a small opening for the insertion and removal of small pieces, whereas both doors may be opened for large pieces. Both doors are of air-lift type, operated by a tilting treadle with manual selector.

The control panel is mounted at eye level on the furnace shell to the left of the door. Two flow meters are regularly supplied, one for air to the generator, the second giving the flow of carburizing (enriching) gas. The charcoal container is mounted on top of the Char-Mo gas

Simplicity!

Cushions—Retaining Collar—Spider. That's all there is to an L-R—but L-R CUSHION MATERIALS ARE ADAPTED TO EACH SERVICE!

L-R Cushions are made of armored synthetic rubber, rubber duck, leather, brake-lining, etc., as conditions require.

L-R FLEXIBLE COUPLINGS

Most efficiently correct misalignment, take up shock, vibration, oscillation, backlash. Extremely quiet.

New L-R Type "C"

Cutaway shows simple construction. Duties, 2 to 2500 h.p. One of many L-R types, 1/6 h.p. up.

L-R Type "H" Pat. and Pats. Pend.

Send for Catalog and Selector Charts.

LOVEJOY FLEXIBLE COUPLING CO.
5026 West Lake St., Chicago 44, Ill.

You Furnish the Brain . . . the Brawn is Provided by

PORTELVATOR
(Portable Elevating Table)

"Not a shop accessory, but a shop necessity" for elevating or lowering; as support; as a level under overhanging work; for carrying almost anything, anywhere, anytime.

Write for Bulletin to Dept. 14

THE HAMILTON TOOL CO.
HAMILTON, OHIO

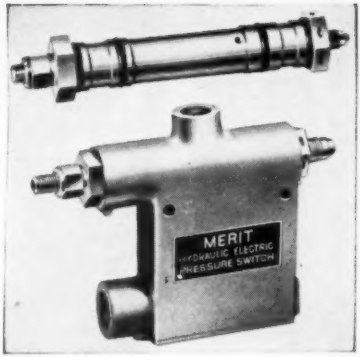
generator which is built into the furnace. The basic atmosphere gas for the furnace is made by reacting carbon (charcoal) with air in a generator built into the furnace so that the gas is formed at furnace temperature.

HYDRAULIC ELECTRIC SWITCH

A new precision-engineered hydraulic electric switch, upon which patents are pending, is said to present features which make it outstanding both as to operating efficiency and long life under severe conditions. In exhaustive tests carried on in temperatures varying from —60° to 160°F, and maintained over extended periods of constant make and break, no appreciable wear was noted. It is made by Merit Engineering, Inc.

The hydraulic valve which actuates the switch is a self-contained cartridge . . . a complete unit . . . renewable and interchangeable, and easily removed or replaced should occasion require. Due to precision design it is chatterless. With two cartridges, having different springs, the entire operating range of 100-3200 psi is covered.

Closely adjusted opening and closing thruout the pressure range is assured by balanced design, supplemented by the two springs. With the first, pressures of 100-400 psi are abtainable; with the second, pressures of 400-3200 psi. A differential of 15 to 18% actuates the switch.



Switch is very compact, with body of bronze or aluminum as desired. Overall dimensions are 4.5″ x 4.08″ x 1.14″, and total weight, with aluminum body is only 22 ounces.

THE "FORM-MASTER"

ANGLE & RADIUS DRESSER

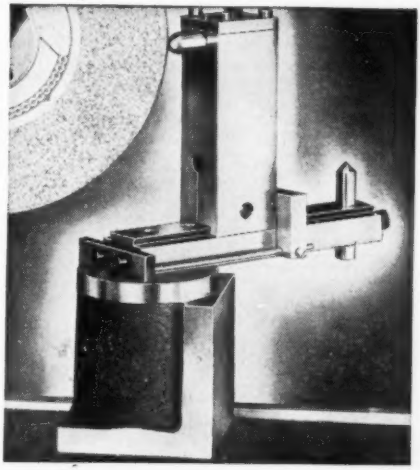
A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — $150.00 complete.

Features

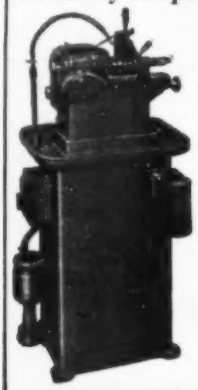
Large range.
Chatterless and dustproof.
.0001″ accuracy obtainable.
Simple to operate.
Reasonably priced.

Call your supplier or write

J. & S. TOOL CO.
477 Main St., E. Orange 2, N.J.



Accuracy . . Speed . . Precision



HAMILTON GEAR HOBBERS

for hobbing PINIONS, GEARS *and* SECTORS

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

Write for further details to Dept. 14.

THE HAMILTON TOOL CO.

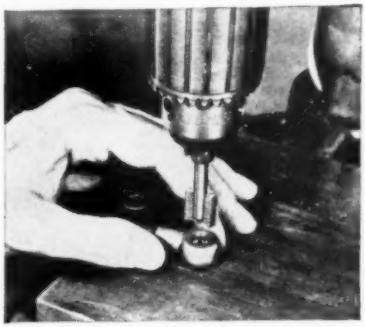
HAMILTON, OHIO

OSBORN DEVELOPS NEW BRUSH

A new series of "Situft" power brushes and brush holders was developed by The Osborn Manufacturing Co., Cleveland, O., and thoroly tested during the final days of war production.

This series of relatively small, versatile brushes utilizes a new principle of wire suspension under pressure. The brushes are equipped with a variety of holding tools designed for use in drill presses, bench grinders and other special production and deburring tools.

The new series is available in a variety of sizes. Outside diameters range from ¼ to 1¼"; brush face lengths from 9/16 to 5/8"; stem sizes to fit 1/16-, 3/32-, and ⅛" chucks; overall length from 2-1/8 to 2¼" and the gauge of wire used ranges from .003 to .005". Shipping weight ranges from two to 4½ ounces.



The brushes have been tested on both long and short shafts for close-tolerance operations, for removing insulation, rust, mold marks and for a large number of operations requiring deburring, cleaning or finishing small diameter inside surfaces.

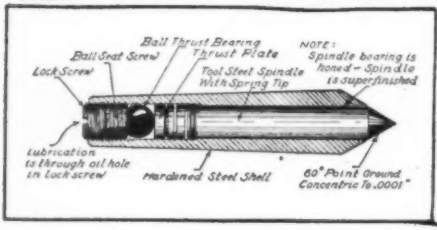
One of the convenient holders designed for many production operations fits into the standard ¼" chuck of portable tools and an easy method has been devised for inserting or removing the brush from holders with special pliers.

The most versatile "Situft", according to Osborn, is the model equipped with .005" wire, and mounted on motors varying in speed from 500 to 25,000 rpm, depending upon the task it is to perform.

Brushes used in the processes covered by the report range from ¼" to 1⅛". In a cleaning operation on a porcelain elec-

NEW **BLUE POINT REVOLVING TIP LATHE CENTERS**

$6.25


Ball Thrust Bearing
Thrust Plate
Ball Seat Screw
Lock Screw
Tool Steel Spindle With Spring Tip
NOTE: Spindle bearing is honed—Spindle is superfinished
Lubrication is through oil hole in Lock screw
Hardened Steel Shell
60° Point Ground Concentric To .0001"

- Runs cool and yields under load to compensate for work expansion
- Same dimensions as standard solid centers
- No more messy lubrication of work centers
- No more damaged center holes in work
- Accurate quality construction throughout
- Saves time—saves money—saves work

No. 2 Morse Taper Shank

Also No.3 & 4 Morse Taper Shank

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ERNEST H. VANDERWALL CO.

538 Polk Street, San Francisco 2, Calif.

trode part, a 5/8" brush is used made of .010 nylon. This type also is being used on a sparkplug cleaning operation at one-half the cost of the method formerly used and in three-fourths of the time previously allowed.

The brush holders which are designed for use on these brushes are constantly increasing their adaptability which often permit stock brushes to be used in a way that enable them to contact definite surface areas regardless of their shape.

STEEL RIVETS

A proposed Simplified Practice Recommendation for Steel Rivets has been submitted to producers, distributors and users for consideration, comment and approval.

The proposed recommendation, which was developed in cooperation with the industry, contemplates the establishment of a voluntary simplified list of stock production sizes (lengths and diameters) for small rivets having round head, flat head, truss or wagon box head and countersunk head, also belt rivets, tinners' and coopers' rivets, and large rivets with button head.

It is expected that the general use of the simplified lists of recommended standard stock types and sizes will result in benefits to all concerned. They should be an aid to the purchasers and users in that these groups will be provided with a guide to sizes of bolts and nuts that are readily available from stock.

Mimeographed copies of the proposed recommendation may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

MANY USES— BIG SAVINGS WITH CERRO

LOW TEMPERATURE MELTING ALLOYS

CERROMATRIX—250° F. For securing punch and die parts; anchoring machine parts; short run forming dies, etc.

CERROBEND—158° F. As a filler for bending thin-walled tubing—melts out in boiling water. Also used for automotive and aircraft assembly jigs, forming dies, etc.

CERROSAFE—165° F. - 190° F. Used for proof-casting cavities in molds, forging dies, duplicate patterns, etc.

CERROBASE—255° F. Used in electroforming dies, molds, etc.

CERROTRU—281° F. Metal molds for wax patterns used to make precision castings.

CERROLOW — 117° F. — **CERROLOW** — 136° F. and **CERROLOW** — 174° F.

REPRESENTATIVES AND DISTRIBUTORS

Brooklyn, N. Y., Belmont Smelting and Refining Works
Ansonia, Conn., Jackson Associates
Boston, Mass., Jackson Associates
Philadelphia, Pa., Castaloy Metal Sales Co.
Cleveland, Ohio, Die Supply Co.
Detroit, Mich., Castaloy Metal Sales Co.
Chicago, Ill., Sterling Products Co., Inc.
Moline, Ill., Sterling Products Co., Inc.
Milwaukee, Wis., Williams & Collins
Minneapolis, Minn., Northern Machinery & Supply Co.
St. Louis, Mo., Metal Goods Corporation
Kansas City, Mo., Metal Goods Corporation
New Orleans, La., Metal Goods Corp.
Dallas, Texas., Metal Goods Corporation
Houston, Tex., Metal Goods Corporation
Los Angeles, Calif., Castaloy Metal Sales Co.
Tulsa, Okla., Metal Goods Corporation
Toronto, Canada Metal Co., Ltd.
London, Eng., Mining & Chem. Prod. Ltd.

Cerro de Pasco Copper Corporation

40 WALL ST. **NEW YORK 5, N. Y.**

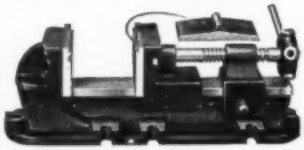
CARBIDE TIPPED NIPPERS

Nippers used for the rapid production cutting of various sized springs made from music wire, ranging in diameter from .004" to 1/16" at the Bridgeport plant of the Underwood Corp., wore away so rapidly that the cutting jaws needed re-sharpening after making an average of 27,000 cuts. Since a skilled operator on this job can easily make some 1500 cuts per hour, this meant servicing the nippers every other day.

To increase length of time between sharpenings, four Carboloy cemented

carbide inserts were set into the jaws of the pliers as shown. Middle sections of both upper and lower jaws, it will be noted, are of steel. The two steel portions are advanced beyond the carbide so that

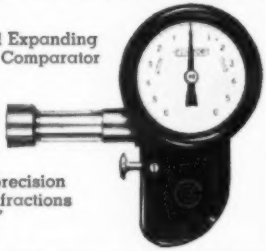
GEM VISES



J. E. MARTIN MACHINE WORKS
SPRINGFIELD, OHIO

Now available for holes down to 1/8"
COMTORPLUG

Patented Expanding Internal Comparator



Gages precision holes to fractions of .0001"

Now available down to .1250" dia. (and up to 7" and larger) Comtorplug makes precision internal gaging simple and sure at machine, inspection bench and by final inspectors. Automatic accuracy showing size, front or back taper, out-of-round, bell mouth, etc.

Request Illustrated 8-page Bulletin 31

THE COMTOR CO.
62 Rumford Avenue Waltham, Mass.

when nippers are closed there is some .0015″ clearance between the facing carbide inserts. Thus the hard metal blanks never actually touch one another when cutting the music wire springs. This design eliminates chance of damage to the carbide edges which might be caused if one carbide edge rubbed against the other under pressure.

The carbide wear-protected nippers shown have been in constant use since before 1939. Performance records show that over 2,000,000 cuts were made with them before it was decided that there was no point in keeping a record since the cutters seemed destined to last "forever". The cutters are still in constant daily use. To date, they have required neither sharpening nor re-setting to compensate for wear.

BRUNING DRAFTING PENCIL

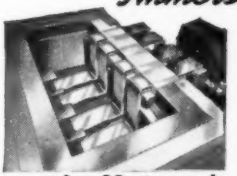
The Bruning No. 3583 Draftsman's Refillable Pencil uses a new type of clutch. It holds the lead firmly in a non-slip rubber grip that prevents the usual nicking and scoring of lead which causes breakage.

Light in weight and properly balanced, this new pencil is especially designed for engineers and draftsmen. Its long barrel

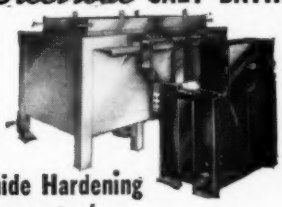
permits use of any full length standard drafting lead, from .079″ to .070″ which includes HB and 9H. The grip is knurled to provide a firm hold, whether held close to or away from the point. The properly tapered point and well proportioned grip merge smoothly with the lead, offering, especially when lettering, greater finger comfort. An adjustable cap provides easy identification of the degree of lead used.

The pencils are available to draftsmen and engineers from the Charles Bruning Co., 4654-8 Montrose Ave., Chicago 41, Ill.

Immersed Electrode SALT BATHS



for



Austempering-Martempering-Cyanide Hardening

Fast — Efficient — Economical

DEMPSEY-ROLNICK Immersed Electrode Salt Bath Furnaces — available in 27 standardized sizes ranging from 400° to 2400° — for all Isothermal and high speed steel treatment. Large, widely spaced electrodes assure low current density and eliminate high localized temperatures.
Our Engineer will gladly show you how this type furnace will answer your problems.

FURNACES: Gas-Electric-Oil-"TAILORED" by DEMPSEY
Meet every Heat Treating Need

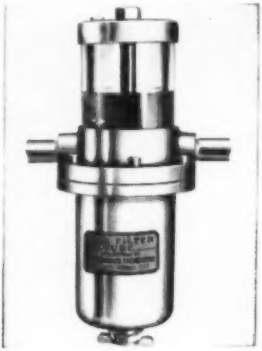
Write for Bulletin 3-7

DEMPSEY FURNACES

DEMPSEY INDUSTRIAL FURNACE CORP.
Springfield 1, Mass.

CCA FILTER-LUBE

CCA Filter-Lube, a compact pneumatic filtering unit combined with a precision lubricator, is announced by CCA Products Engineering, P. O. Box 671, Glendale, Cal. Primary use is for installation as close as possible to equipment it is intended to service, including air cylinders, vises, chucks or any reciprocating or rotary air tools.



Designed to prolong life of all types of pneumatic equipment, prevent freezing of air-operated devices, and deter inroads of corrosion, the device is the latest development in a long line of industrial equipment by this manufacturer.

Available in ¼", ⅜" and ½" standard pipe line sizes, Filter-Lube is simple to install on air supply lines. It features a full view, lightweight, transparent plastic lubricator oil reservoir.

A needle valve oil regulator, easily adjustable to meet varying lubrication requirements, permits correct amount of oil to mix with filtered operating air.

The lower element is composed of a sludge basin of ample size and an all wool felt filter media. Fully automatic in operation, the device first filters incoming working air, and next provides a finely adjusted lube-mist, perfectly regulated according to equipment requirements. The makers claim that thru use of the device, no flood of oil is permitted to enter working equipment, and no oil starvation is possible; thereby eliminating loss of equipment and man hours in adjustments and repairs.

IS TAP BREAKAGE Your Problem?

Dorman Tapper Adjustable Friction Drive and Floating Chuck Jaw Can Solve It.

Delivery From Stock Some Sizes.

No. 1 Friction Tapper drives from 2-56 tap to ⅝" tap in steel or any other material. Simple adjustment changes light friction to positive drive or any intermediate stage.

No. 2 Positive Tapper drives from ⅝" to ¾". No. 3-A Positive Tapper drives from ½" to 1¼" in steel or other material. Floating Chuck Jaw automatically centers tap. Write for details.

DORMAN MACHINE TOOL WORKS
355 CANAL ST. • NEW YORK 13, N. Y.

FAST

WITH HERCULES HOLDERS AND TYPE

WRITE FOR

1 ILLUSTRATIVE LITERATURE AND PRICE LISTS
2 NEW BROCHURE ILLUSTRATING OVER 100 MODERN MARKING TOOLS AND MACHINES

CONSULT THE ORIGINAL "MARKING SPECIALISTS" FIRST!

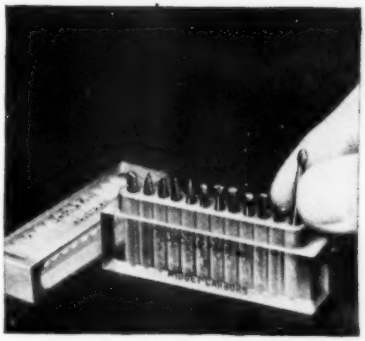
The ACROMARK Company
15 Morrell St.
ELIZABETH 4, NEW JERSEY

The felt filter media, interchangeable and reconditionable, guarantees protection against free moisture, oil sludge, dust clogging, corrosion or pitting. Filter-Lube functions only when equipment is in operation.

MIDGET CARBURS

Rotary files of solid tungsten carbide are now being manufactured in extremely small sizes by Lincoln Park Industries, 1729 Ferris Ave., Lincoln Park 25, Mich. These tools, known as Midget Carburs are furnished in sets for tool room, die shop, pattern shop and general production use. The set consists of 12 tools in assorted shapes contained in a plastic case which provides a convenient method of protecting the tools.

In application, they serve as a replacement for hand files and mounted grinding wheels in innumerable operations requiring these tools. Their extreme hardness permits them to be used on practically any material, including hardened steel up to 65 Rockwell C. They will cut many times faster than grinding wheels, being run at speeds from 65,000 to 100,000 rpm. Sharp corners, forms and radii can always be maintained. On softer materials the same advantages are apparent, and in addition their life is said to be at least 50 times that of steel files.



The 12 tools produced for the standard set, which may be purchased individually if desired, are 1-1/8" overall with 1/8" diameter shanks. A new descriptive bulletin containing full specifications is available.

DRILL JIG

BUSHINGS

A.S.A. STANDARD types and sizes in stock for immediate delivery.

Excellent delivery on NEW GAGES and GAGES salvaged by HARD CHROMIUM PLATING.

Write today for particulars

ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN

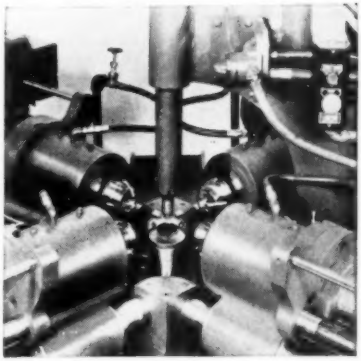
HOLLOW MILLING MACHINE

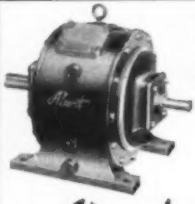
A new hollow milling machine for heavy duty work has been developed by LeMaire Tool & Mfg. Co., Dearborn, Mich. It is built up of several standard elements.

A standard LeMaire No. 5000 Hydraulic Unit mounted on a standard base is used to power each of the four stations. All four bases, arranged at right angles to each other, abutt a central base, which carries a special fixture.

Each unit is a machine by itself and can be operated at speeds independent of the others. Infinite feeds are controlled by flow valve and the spindle speeds are controlled by rheostat located on a variable speed unit within convenient reach.

Since separate motors are employed to furnish power to hydraulic pumps and to spindles, any desired change in speed of one does not affect speed of the other.





For the Speed-up of Re-conversion

Abart **SPEED REDUCERS**

SPUR, WORM, and COMBINATIONS

More than 75 types and sizes. For all services from 1/50 to 417 h.p. Compact rugged construction. Bring your reduction problems to Abart. Ask for Catalog with diagrams and comprehensive data.

ABART GEARS. Cut to specifications only. No stocks. Send specifications.

Abart **GEAR AND MACHINE COMPANY**

4832 W. 16th St. Chicago 50, Ill.

Spindles are of heavy duty construction. They are mounted in a sturdy housing which slides on large guide bars. The large opposed Timken Bearings have their front bearings positioned close to cutter so front overhang of tool is reduced to a minimum.

High pressure coolant is forced inside spindle for chip removal.

The air operated fixture has an electric inter-lock to prevent cycling of the machine before part is clamped. A nest arrangement, used to locate part in the fixture, facilitates change-overs.

A production of approximately 180 pieces per hour is claimed for spiders having journals ¾" long and ¾" diameter. The machine was designed to hollow mill and face shoulder on universal joint spiders with journals ranging from ½" to 1⅛".

SAYLOR STIKT NUT

A lock nut which is claimed to stay put has been developed by Frank D. Saylor & Son, 13095 Greely Ave., Detroit 3, Mich.

The nuts are of standard type being available in a complete range of sizes and can be made of steel, iron, aluminum brass, or practically any other metallic and certain non-metallic materials. The nuts are heat and mechanically treated to make them adhere to the bolts with any required degree of tenacity.

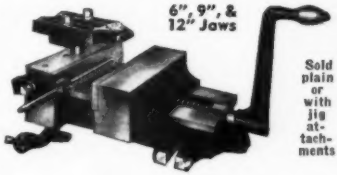
HACK SAW CARE

Selection of the proper blades for cutting various metals, causes and cures of common blade difficulties, and hints on "how and how not to do it," are featured in a new 30-page illustrated booklet offered by Clemson Bros., Inc., Middletown, N. Y., manufacturers of Star hack saw blades.

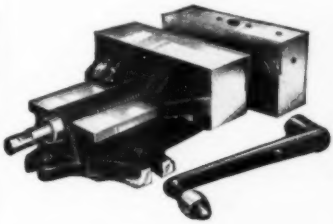
The pocket-size booklet includes data on both hand and power blades, and except where text states otherwise, the recommendations apply to the blades of all manufacturers.

Entitled "Metal Cutting," the booklet is an up-to-date revision of an earlier edition of which several thousand copies were distributed. Specifications and price lists are also included.

3 SIZES -- UP TO 124 LBS.



GRAHAM MULTI-PURPOSE VISE



While you're developing new models, let this vise supply ready-made jigs and fixtures. Its accurate, flush, parallel, square construction — plus numerous stops, guides, bushings, shell and V-jaws, etc. — enables it to hold all sorts of shapes for repeat-operation work. Sizes for drill press, radial, planer, shaper, miller, grinder.

Request Illustrated Price Circular

GRAHAM MFG. CO.

53 Bridge St., East Greenwich, R. I.

LEMPCO OFFERS NEW REAMER

Lempco Products, Inc., 5729 Dunham Rd., Bedford, Ohio, announces a new design Dual-Spiral Expansion Reamer. The principal change in the new design is a solid one-piece body all the way from the driving end to the lower lock nut. This one-piece construction considerably reduces the number of component parts. In addition, because of its increased rigidity, the cutting blades are said to spiral even more concentrically than previously, and runout is held to an absolute minimum, insuring accuracy to extremely close tolerances.

AMPCO PRODUCTS LISTED

A group of new folders and catalogs featuring its products has been issued by Ampco Metal, Inc., Milwaukee, Wis. Bulletin 68, 8 pages, contains information on resistance-welding, including electrodes and alloys.

Bulletin W-3, 8 pages, is devoted to Ampco-Trode coated aluminum-bronze electrodes, used for the welding of bronze and its companion alloys. Five different-purpose electrodes are described.

Bulletin W-2 is a 20-page illustrated manual on Ampco-Trode welding technique. The material is divided into six parts, including:—Introductory, metallic arc welding, carbon arc welding, oxy-acetylene welding, machining data and an Ampco weldability chart.

Bulletin No. 66, consisting of 12 pages, describes the machining of Ampco metal. The information is based on practical experience in the Ampco machine shop in machining Ampco metal and aluminum-bronze alloys. Photographs and diagrams illustrate the text.

Catalog No. 116 is a 20-page listing of Ampco beryllium-copper non-sparking safety tools. This extensive line is made for use wherever inflammable gases, explosives or other hazardous conditions are present, and where the striking of a spark may constitute a great danger.

A.C. CURRENT ANYWHERE
with KATOLIGHT PLANTS and GENERATORS. Furnish same kind of current as city highlines for operating standard A.C. appliances for standby or continuous service.

32-Volt Motors Available Immediately
Immediate production 1/4, 1/3, 1/2 h.p., all steel construction, high efficiency, suitable for vertical or horizontal mounting.
During the past few years we have developed a lot of "know how". Give us a chance on your special requirements.
Manufacturers of high frequency generators, motor-generators, rotary converters, A.C. and D.C. generators, gas-engine driven battery chargers.
KATO ENGINEERING COMPANY,
530½ N. Front St., Mankato, Minnesota

DIE CUSHION DATA SHEETS

Three interesting and helpful data sheets apply to the general practice of figuring the size and capacity of pneumatic die cushions for a large percentage of inclinable presses.

One of these gives rules for finding die cushion size and ring holding pressure when dimensions of first drawn shells are available.

Another gives die cushion recommendations and data for 20 different types of inclinable presses.

A third bulletin illustrates and describes the air cushions available.

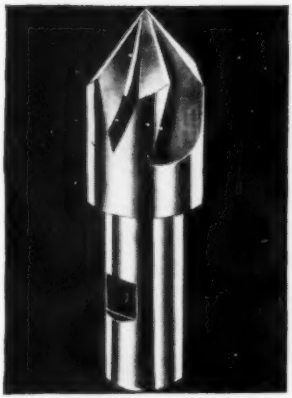
Copies are available from Dayton Rogers Mfg. Co., 2849 12th Ave., So., Minneapolis 7, Minn.

CHART ON ALLOY WELDING

A new and unusual reference chart on high and low alloy welding electrodes is available. The data includes tables on corrosion resistance, on heat resistance, and on weld metal surfacing, as well as the chemistry of the weld metal. Welding current and voltage tables give information of value to the operator.

The chart is 20" x 30" for wall mounting. A copy will be sent upon request to Arcos Corp., 1515 Locust St., Philadelphia 2, Pa.

TRU-CUT COUNTERSINKS



The Tru-Cut Tool Co., 14236 Birwood Ave., Detroit 4, Mich., announces production of a new line of Tru-Cut Chatterless Countersinks for use on all kinds of metals. These specially designed four-fluted countersinks are made of solid, high-speed steel for long life and trouble-free performance.

According to the makers, the "chatterless" feature of these countersinks is assured by the design which features two positive and two negative cutting angles ground into the tools. The positive cutting angles tend to pull into the work while the negative angles push away from the work These simultaneous operations are said to result in a balanced cutting action which automatically eliminates "chatter".

Another noteworthy feature of design is that these tools are not milled on a spiral but on a direct angle. Thus the cutting action changes from ahead-of-center to back-of-center, with each flute engaged in a progressive action for most effective work.

Tru-Cut Chatterless Countersinks are available in standard angles of 60,° 82° and 90°, in sizes from ¼ to 2". Other angles may be made to specifications to meet individual requirements. If desired, flat may be milled on shank.

MEASURING A PLUG GAGE with LIGHT WAVES

using an optical flat, a toolmakers flat and a gage block

The formula is:

$$D = h + \left(.000012 \times N \times \frac{W}{w}\right)$$

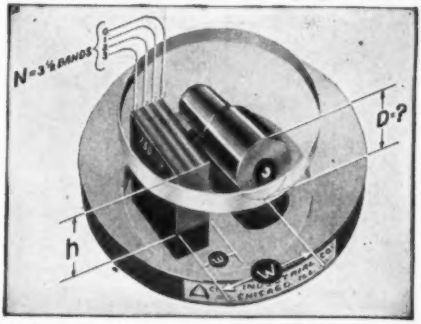
Substitute the actual values

$$D = .750 + \left(.000012 \times 3\tfrac{1}{2} \times \frac{1\frac{7}{16}"}{23/64"}\right)$$

and get the answer

D = .750168 inch.

It's just that simple!



Write for new, free Lightwave Measurement Booklet.

ACME INDUSTRIAL CO.

SCIENTIFIC DIVISION

Makers of Standardized Jig and Fixture Bushings

210 N. Laflin St. MONroe 4122 Chicago 7, Ill.

BENDING SMALL TUBING

A new hand-bending tool, which permits all kinds of small tubing to be curved to any desired angle, has been developed at the Glenn L. Martin Co., Baltimore, Md.

Designed by a Martin employee, Carroll E. Adreon, the new tool consists of a sturdy steel base which may be used in a vise or clamped onto a bench; a revolving radius rod equipped with a handle for turning; a stop block grooved to hold the tubing; and a movable radius block which guides the tubing around a bend roll centered on top of the base. This roll, cylindrical in shape and also grooved has a top plate scribed in 360°. A measuring point is marked on the movable radius block. The radius and holding blocks and roll are so grooved as to prevent crushing or change in section of the tubing.

In operation the tubing is inserted in the groove of the stop block and the movable block which has been returned to the zero degree point. The movable block is then pulled around the bend roll, being connected to the revolving radius rod, until the measuring point is directly opposite the mark of the angle desired in the bend roll.

Allowances can be made for tubing having a "spring back" characteristic by

CLOTHESPINS or GAS MASKS ?

Foul coolant is a trouble-maker. Apart from griping among the men, it may fail to do its work properly—may slow down production.

Let a Dolge service man make a competent examination of your coolant to determine whether sanitation is indicated. A sample is all he requires for laboratory analyses. Then a complete, confidential report will be submitted promptly without charge. Write for booklet on "Cutting Oil Sanitation".

AVAILABLE! SPRAY CONTAINING D.D.T. WRITE FOR DETAILS

THE **C. B. DOLGE** CO., WESTPORT, CONNECTICUT

STERIDOL *Cutting oil germicides*

merely moving the measuring point to as many degrees beyond the desired angle marking as the tube will spring back when released. An operator can easily measure this amount of allowance needed from the spring back shown on the top plate of the bend roll, when pressure on the handle is released. Utilizing the same principle, tools may be made for bending tubing of any size.

By the simple substitution of a set of phenol fiber blocks, similar in design to the metal blocks, hot-dipped or tinned spiral high-electrical cables (for example, battery cables) also can be bent. Use of the phenol fiber accessories prevent the semi-molten coating on the wire from adhering to the blocks, as would be the case with use of the steel blocks on the original tool.

Chief advantages of the new device lies in the great amount of time saved as compared to ordinary hand bending operations, the extreme accuracy to which the tubing can be turned and a material saving in that there is no scrap due to the tubing being crushed or split during the operation.

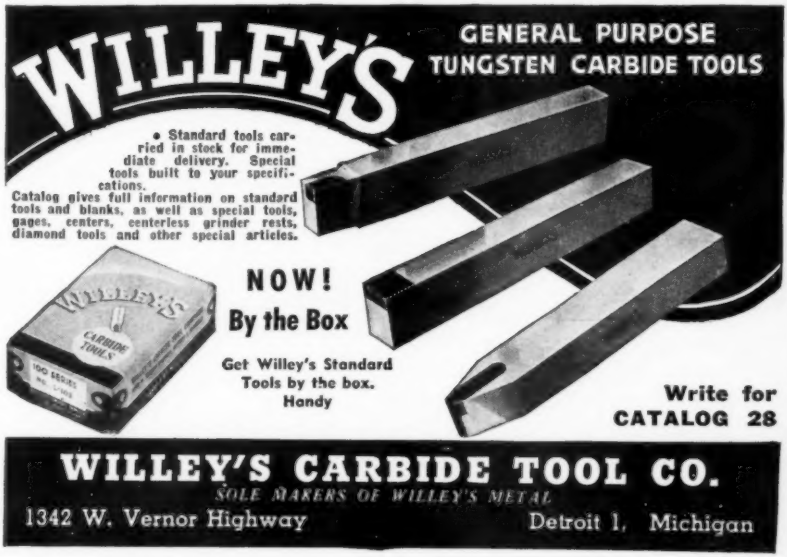
COOLING A MOTOR WITH GASOLINE

Motors sometimes find themselves in strange environments. One motor developed by Westinghouse to drive a booster fuel pump for a jet-propelled plane will be mounted in the fuel-tank itself. The motor is made explosion-proof. The fuel, gasoline or kerosene, is circulated between an outer housing and the frame to keep the motor cool. The motor develops 2¼ hp at 8000 rpm, but weighs less than 20 pounds.

SOLDER-JOINT FITTINGS

Printed copies of Simplified Practice Recommendation R212-45, Cast-Brass Solder-Joint Fittings, are now available. The recommendation sets up a stock list of cast-brass solder-joint fittings representing the best thought of the industry, its distributors and customers as to what constitutes desirable practice for the immediate future. Sketches illustrate the 37 types of fittings, various sizes of which are included in the list.

Copies of Simplified Practice Recommendation R212-45 may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 5 cents each. A discount of 25 percent on orders for 100 or more copies is available to those desiring to purchase a supply of this publication.


WILLEY'S
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Catalog gives full information on standard tools and blanks, as well as special tools, gages, centers, centerless grinder rests, diamond tools and other special articles.
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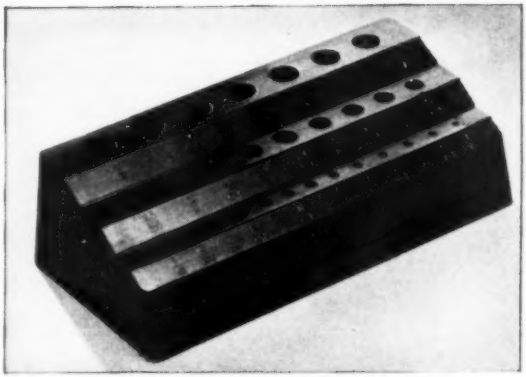
CATALOG 28
WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway
Detroit 1, Michigan

Designed to replace the ordinary wooden drill stand, this molded Durez stand offers a number of advantages. It will not swell or warp when exposed to moisture and is easily cleaned. Its production is simplicity itself. Whereas wood must be cut, shaped, and drilled (29 holes ranging in diameter from 1/16 to ½") the Durez piece comes from the mold complete with raised lettering molded-in. Except for removal of flash, further finishing operations are unnecessary. Molding is by Plano Molding Co.



METAL CUTTING SAWS

A Simplified Practice Recommendation for Hard Edge, Flexible Back, Metal Cutting Band Saws has been approved for promulgation. It is effective from Dec. 17, 1945, and will be identified as R214-45.

The recommendation, which was developed in cooperation with the industry establishes a voluntary simplified list of regular type and skip-tooth type of hard edge, flexible back, metal cutting band saws. It is believed that the recommendation will satisfactorily meet all regular requirements.

Until printed copies are available, free mimeographed copies may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

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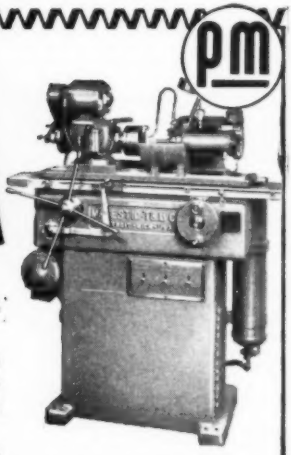
From Internal to External Makes
PARKER-MAJESTIC
LEADER IN THE GRINDING FIELD
★
For Precision Grinding



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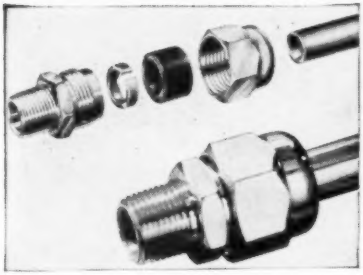
FLEXIGRIP TUBING FITTINGS



Flexigrip time-saving tubing fittings which eliminate end preparation or soldering of the tubing and yet produce a stronger, leakproof and flexible joint have been announced by Gustin-Bacon Mfg. Co., Kansas City, Mo. The Flexigrip fitting, made in standard sizes from ⅛" to 1½" O.D., consists of four parts—the body, a gripping ring, synthetic rubber gasket and nut. To attach the fitting, the nut (with gasket and ring inside) is slipped over any plain-end tube, cut to desired length. The tubing end is inserted into the body as far as it will go and the nut tightened. Tightening the nut compresses the ring into a tight grip and moulds the gasket around the ring for a leak-proof seal that is so flexible it will withstand unusual vibration or impulse.

Elimination of flaring, swedging, or soldering the tube end adds considerably to the strength of the joint as well as saving time and labor. Economies in time and material are also considerable over the collar, ring or ferrule types of tube-end fitting. Fittings are available in brass, aluminum or steel.

SUNDSTRAND PUMP BULLETIN

A new bulletin has been issued by Sundstrand Machine Tool Co. Pump Div., 2535 Eleventh St., Rockford, Ill., devoted to the "Sundstrand Hydraulic Pumping Unit For Both Low Pressure—Large Volume, High Pressure—Small Volume". The bulletin contains illustrations, description of the operating principles, features, possible applications and engineering data for this Sundstrand Hydraulic Pumping Unit.

PALMGREN

No. 60 FLANGED MILLING MACHINE VISE

The Popular Vise PRODUCTION MEN ARE RAVING ABOUT

PRICE ONLY $49.50

End Your Production Worries

Standardize your shop with this modern heavy duty milling machine vise and your production worries are over for good.

It's the ideal vise for Milling, Drilling, Grinding, Planing, Shaping, etc. Provided with bolt slots for clamping down to the table of the various machines. It is equipped with hardened and ground steel jaws, 6" wide, 2" deep, opens to full 6". You'll say it's the sweetest job you ever saw and like many leading shops now using them, you, too, will profit by lower production cost and more efficient work.

Order today from your dealer or Write for Circular No. 350

CHICAGO TOOL & ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS *for over 28 years*

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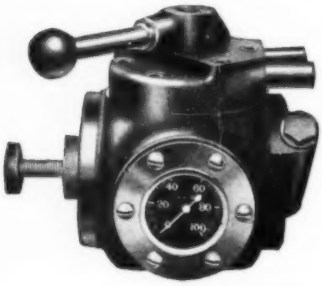
Marton
AIR CONTROL UNIT



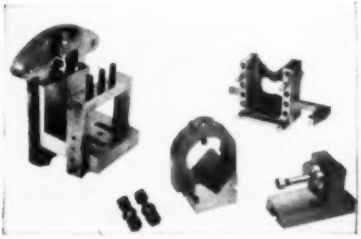
This convenient unit is adaptable for all air operated machines wherever air control is required. Pressure regulator, gauge, control valve, lubricator and strainer are combined in one efficient, time-saving mechanism.

MARTON
EQUIPMENT, INC.
105 Rantoul St., Beverly, Mass.

LATHE ANGLE PLATE

A universal angle plate for lathe use is designed to take the place of special jigs and fixtures ordinarily required for holding irregular shaped work that cannot be chucked in the usual manner. It is manufactured by Best Tools, Inc., with Madco Products, Inc., 516 Fifth Ave., New York 18, N. Y., as sole distributors.

Virtually a tool makers' angle plate mounted on an adjustable base for attachment to the face plate of a lathe, this device together with its accessories makes possible precision machining of off-set inside and outside diameters, bushing and die plates, irregular shaped castings, and scores of other jobs, without special fixtures. Angle plate is L-shaped with side face 5⅛ x 4" and bottom face 5⅛ x 5⅜". It is mounted on a sturdy base provided with an adjustment screw and ground ways, and is fitted with gauge points so that work can be accurately and quickly positioned with size blocks or calipers. A straddle clamp with adjustable set screws is provided to tighten work against bottom face of angle plate.



One of the most practical accessories available with the angle plate is a fixture for holding plates. This device, which is particularly useful in machining bushing and die plates, consists of a box-like structure with a T-slot at bottom for mounting on angle plate. Side walls of the fixture are provided with holes spaced 1" apart, thru which undercut clamp pins can be positioned. When a plate is to be clamped in the fixture, pins are located to fit dimensions of the plate. Then by tightening nuts on back ends of the pins, plate is drawn securely against ground surface of fixture. Once locked in place, plate can be further positioned by using adjustment screw on the angle plate, and "Jo" blocks at gauge points if extreme accuracy is desired. This work holding

fixture will hold rectangular, circular and irregularly shaped plates up to 5" in width and 1" in thickness. A chief advantage of boring die plates by this method instead of with a jig boring machine is that tapered clearance holes can be machined more easily and accurately.

Another accessory available is a large V-block and clamp designed to hold rounds up to 3" in diameter. It is attached to base of the angle plate with T-bolts and can be positioned at any angle to facilitate machining of eccentrics, diameters at off-set angles, off-center holes, multiple angle holes, etc. The V-block is heavy in construction and precision ground all over.

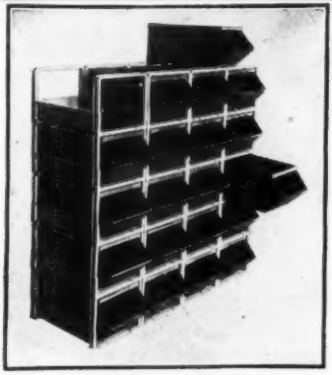
The third available accessory is a special indexing head which is also attached to angle plate by means of T-bolts. It can be secured in any position on angle plate and is particularly useful in positioning work for radially spaced machine operations. The indexing head consists of a spindle or hub supported horizontally by a sturdy base. A flange at one end of spindle is provided with a projecting pin designed to fit into a ring of holes in base that are spaced at 15° intervals. Thus, with this unique indexing head, facing, boring, turning, etc., can be performed at intervals of 15° or any multiple thereof.

PRECISIONAIRE CATALOG

An attractive new catalog which illustrates and describes the Sheffield Universal Precisionaire Instrument has been published by The Sheffield Corp., Dayton 1, Ohio, and copies are available to engineers and industrial executives upon request.

The Precisionaire is an air-flow gage that measures thru air velocity instead of pressure. It is widely used in the checking of all types of small and long bores to very close limits. It is especially recommended for checking outside, internal and average diameters, eccentricity, bell-mouth, out-of-round, thickness, straightness, as well as width, length, heighth and depth. According to the makers, with the use of this instrument the human element of error is eliminated and no special skill is required of the operator. Accuracy is instantaneous, and it is impossible to have any time lag.

Precisionaire is available in a wide range of amplification from 1000 to 1, to 25,000 to 1. The latter instrument is calibrated with a scale reading in increments of five-millionths of an inch.



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STACKBIN sections will give you a Stockroom wherever you want it—quickly and easily as building a sectional bookcase. These patented sectional storage bins nest together without the use of tools—cost you nothing to build, nothing to move. Find out today how STACKBINS can lower YOUR handling costs.

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"LESSONS IN ARC WELDING"

"Lessons in Arc Welding," is a revised and up-to-date new printing of the second edition, to assist both new and experienced welders as well as all persons interested or concerned with the subject, with complete and thoro instructions in all phases of arc welding.

The book includes 61 lessons in arc welding and has over 200 photos and illustrations to supplement the text. From the very first paragraphs dealing with "Instructions to the Operator," to the 571 examination questions and answers given in the closing pages, the book sets forth in plain simple language, the practical instruction based on the experiences of Arthur Madson, head instructor in the Lincoln Arc Welding School. Mr. Madson has taught thousands of students to become practical, successful arc welding operators.

Published with the objective of aiding those interested in welding to use the process successfully and economically, the book explains the fundamentals of this method of joining metals by the fusion principle and incorporates a wealth of new information such as how to apply the latest types of electrodes and welding techniques developed during the war years.

The book has 176 pages, 5½ x 8½", semi-flexible simulated leather cover and will be mailed postpaid in the U.S. for 50c per copy—foreign distribution, 75c per copy. Address Lincoln Electric Co., Cleveland, Ohio.

AIR AND HYDRAULIC CYLINDERS

A new line of air and hydraulic cylinders with unique mounting features and steel construction is being manufactured by Miller Motor Co., 4027-33 N. Kedzie Ave., Chicago 18, Ill. The 200 lbs pressure air cylinders have steel heads and caps and brass cylinder walls. The 1,500 lbs pressure hydraulic cylinders have solid steel heads, caps and walls.

In providing all steel heads, caps and separate interchangeable steel mountings, Miller has broken away from the custom of using castings for these parts. Flexibility of use is obtained by offering a universal cylinder that may be mounted directly on extended tie rods, or with any of the standard styles of brackets attached to the tie rods. Thus any cylinder can be adapted to all different uses by simply changing the steel brackets. Also, five

LINLEY MILLER and JIG BORER

HAS A SPEED FOR EVERY NEED

Make a resolution this year to get small tool room jobs done quickly and economically by using a Linley which has 8 spindle speeds to 4250 r.p.m.

Widely adaptable for die work, jig boring, milling, drilling and reaming. Saves larger machines for their rated capacity. Fits in any 2½ sq. ft. of space.

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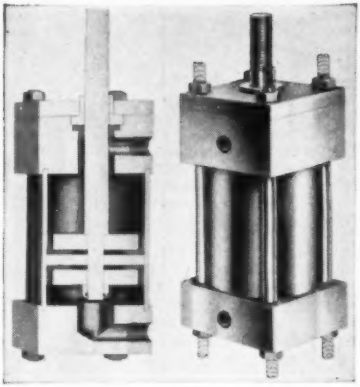

new tie rod mounting styles are offered.

Other features stressed are: (a) fabricated square steel heads and caps; (b) piston rod bushing is locked between a retainer plate and steel shoulder of cylinder head; (c) bushing is piloted without threading into cylinder head to preserve close fit and concentricity; (d) all parts are precision built to close tolerances, and interchangeable; (e) honed tubing is used for cylinder walls—steel for hydraulic and brass for air; (f) adequate ports for rapid, economical operation; (g) identical basic dimensions and mounting dimensions for both cushioned and noncushioned models.

Chief users to date are manufacturers of welders, bending machines, tire and plastic moulding machines, presses, automobiles, and swaging machines. Application of the cylinders to modern machinery is extensive, new uses being constantly added where a push, pull or lift is required.

Bulletin A-103 on standard air cylinders (200 lbs pressure) and Bulletin H-104 on hydraulic cylinders are available.

STRIPPIT APPLICATION

The use of Strippits for stripping metals from conventional dies is described in the second edition of catalog "S", issued by the Wales-Strippit Corp., North Tonawanda, N. Y. The 8 pages carry large diagrams and reproductions of photographs, which show the use of the product in a variety of application. Attention is called to the firm's engineering facilities for developing and designing special applications for Strippits.

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PHILLIPS VAPOR DEGREASERS *Give You*

- √ 68% greater flushing action.
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- √ Reclaims solvent while working . . . No shutdowns.
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Using PHILLSOLV . . . The Safe, High Efficiency, Premium vapor degreasing solvent.

PHILLIPS MANUFACTURING CO.

3447 W. Touhy Ave. Chicago 45, Ill.

IDEAL ELECTRIC MARKER

Almost everything can be marked with an Electric Marker offered by the Ideal Commutator Dresser Co., 1441 Park Ave., Sycamore, Ill.

Altho small in size, (only 6" long and 10 ounces in weight) tests prove that the Marker can be used continuously on tough marking jobs.

Using new principle in design, power of the cutting stroke has been increased by 30% over previous models. Yet, an adjusting nut makes it possible to vary the impact so that it can be used to mark on glass. Shaped to fit the hand, it can be held and used to write almost as easily as a pencil.

It operates from any a-c outlet. Operating like a small electric hammer, it makes 7200 cutting strokes per minute, cutting right into the surface leaving lines that cannot be wiped away or worn off with ordinary usage. Permanently marks sizes, names, numbers and other important information on tools, parts and finished products. Marks iron, steel, bronze, aluminum, ceramics, tile, marble, lead, plastics, porcelain, glass, etc.

All parts are enclosed and ready for use. For average marking, a hardened alloy point is furnished as standard. If extra hard materials from 54 up to 64 Rockwell hardness Scale C are to be marked, a diamond point is recommended.

The "WOBBLIES" Must Go!

Machine Shop Questions About DY-NAMIC BALANCE Answered in this

FREE CATALOG

More and more specifications are calling for machine shop products that are Dy-Namically Balanced. Efficiency-destroying vibration "Wobblies" must go! This new catalog describes the latest Bear Dy-Namic Balancing Machines that are eliminating the "Wobblies" in the products of hundreds of leading companies in over 20 different industries. It shows how YOU can obtain a much faster, lower-cost method of Dy-Namically Balancing any size rotating part from 4 oz. up to 4,000 lbs.

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Rock Island, Illinois

BEAR *DY-NAMIC BALANCING* **MACHINES**

"DRILPILOT"

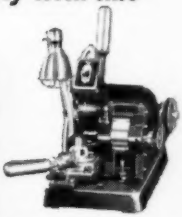
Aircraft Tools, Inc., 750 E. Gage Ave., Los Angeles, Cal., offer a new tool known as Drilpilot which for the first time permits drilling and countersinking, drilling and spotfacing, or drilling and counterboring in one operation. Drilpilot's interchangeability makes it possible to perform a greater number of operations with a single tool.

Of rigid, simple construction, this new tool is made of high speed steel, carefully ground for close tolerance after hardening. Body of drill is 5/8" long with a 9/16" flute length, thus leaving 1/16" of solid drill body which acts as a pilot after hole is drilled. Shank is .086 diameter and 5/8" long. Comes only in standard rivet sizes Nos. 40, 30, 21 and 10. Drilpilot can be used in place of any standard pilot.

Drilpilot can easily be changed over from one job to the next and put thru a wide range of operations. In combination with Aircraft Tools' standard stop countersink or microset stop countersink, it permits drilling and countersinking in one operation to a predetermined diameter of countersink. Used with standard angle drill adapters or angle drill attachments, drilling and countersinking or drilling and spotfacing can be performed in most difficult-to-reach spots.

MILL SMALL PARTS... *Fast—* *Accurately with this*

NEW *Rouse* HAND MILLER



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Rouse **Fixture Set-Ups that Speed Production.**

It's a high-speed, motor-driven unit that has many uses in finishing operations for light cuts on aluminum, brass, steel and other metals . . . also, rounding and burring steel and cast iron. Inexperienced operators quickly learn to use it with speed and precision.

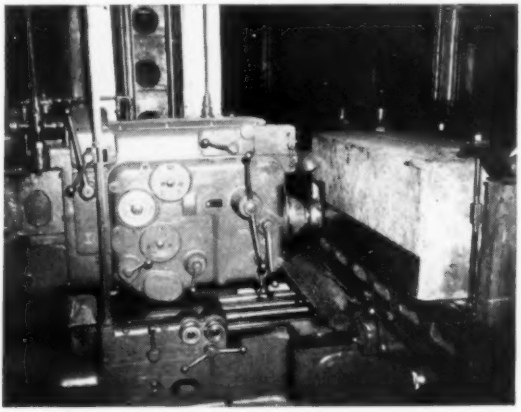
The Rouse Hand Miller, with Rouse Fixture Set-Ups, provides fast, accurate, low-cost milling for a big variety of small parts used in electrical work, instruments, aviation, communications and similar work.

Available for immediate shipment. Write for illustrated circular and full details.

H. B. ROUSE AND COMPANY
2216 N. Wayne Ave. Chicago 14, Ill.

KENNAMILLING DEMONSTRATIONS

KENNAMILLING, combination of a carbide and a new technique in milling, was demonstrated to many industrial organizations in the Philadelphia and New York areas during October. The demonstrations were repeated during November at the Giddings & Lewis Fond du Lac plant and at Sundstrand Machine Tool Co., Rockford during December.



Milling a 60"x30" surface with an 8" diameter cutter on a Sellers No. 5 Horizontal Bar.

More than a thousand management and production officials representing these organizations witnessed the demonstrations of a radically new method of milling in the Wm. Sellers plant, Philadelphia, Pa. The new technique was applied to a large variety of materials ranging from steel to magnesium alloys and including armor plate, Meehanite and semi-steel cast iron.

Kennametal, Inc., Latrobe, Pa., sponsored the demonstrations which were possible thru cooperation of the Wm. Sellers Co., and the Sundstrand Machine Tool Co., Rockford, Ill. In addition to suitable factory space in the Sellers plant, this latter organization also made available a No. 5 horizontal bar machine and a Brown & Sharpe 7½ hp horizontal knee-type milling machine. The Sundstrand Machine Tool Co., provided a heavy duty 25 hp Rigidmill and a 25 hp high spindle speed Rigidmill. Kennametal, Inc. moved a 55 hp Milwaukee CSM vertical milling machine to the Philadelphia Sellers plant for these demonstrations. Thus there was more than 100 hp available for the demonstrations, ranging from a standard 7½ hp machine to the 55 hp specially engineered equipment for carbide milling. It is interesting to note in this connection that the Brown & Sharpe 7½ hp machine used in these demonstrations so effectively is 12 years old.

Visitors at both afternoon and evening shop sessions witnessed milling operations on the 7½ hp standard knee-type milling machine, milling SAE 1040 steel at 26" per minute, which definitely proved to them that conversion to carbide need not be delayed awaiting new equipment, however desirable and more effective.

An armor plate component of a tank turret, milled with extreme difficulty during the war at ⅜" feed rate, was straddle-milled on the Sundstrand

Grinding solid carbide blades in grinding block on surface grinder. All angles, both cutting and clearance are included in this grinding block.

heavy duty Rigidmill at 17" per minute. This unusually difficult operation included an interrupted cut; nevertheless the Kennamills performed to advantage and with exceptional cutter life.

The advantages of the new process were dramatically presented in the milling of a 6½ ton semi-steel cast iron component set up on the Sellers No. 5 bar unit. Five high speed steel

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CURTISS-WRIGHT CORPORATION RANKS OUR PRODUCT WITH *THEIR* BEST TOOLS. CLEVELAND GRAPHITE BRONZE COMPANY, LEADING BEARING MANUFACTURER, STATES NEW HIGH ACCURACY REACHED, PLUS SUBSTANTIAL PRODUCTION BOOSTS.

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Patent Pending

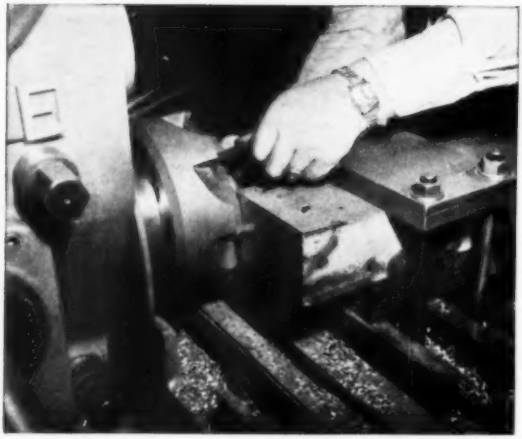
Quotations Definitely Moderate

Good delivery Schedules

NO MORE "C" WASHERS, WRENCHES, DRAWBARS, NO MORE ARCS OR TAPERS BEFORE OR AFTER EXPANSION GRIP — CONCENTRICITY IN LOW 10,000ths — PRODUCTION OR INSPECTION.

Assured parallelism of sleeve surface to center line — absolutely no variation in repeated mounting of parts. Uniform full-work-length friction-locking gives complete control and contact of entire bore surface area — Absolutely no variation in repeated mounting of parts — no tapers — Slip part on mandrel with slight counter-clockwise motion, that's all — it's ready — Self-contained, self-expansion, self-locking, self-contraction. Instant unloading, no jamming, no adjusting — Interchangeable sleeves — you do not obsolete Young Mandrels. — Built to your bore tolerance high limit, with automatic contraction to low limit — Any mounting — Any machine operation — For bore diameters .718 to 5.5 — Reduces tool costs, extra equipment investment, operating costs, maintenance, down time, scrap, salvage.

YOUNG ARBOR COMPANY, 3257 Bradford Rd., Cleveland Heights 18, Ohio



Setting blades in 8" diameter face Kennamill to the shoulder of a fly cut. The O.D. of all blades have maximum run out of .0005" by this method. Surface finishes are superior to those obtained by grinding cutter in a cutter grinder.

cutters were dulled in taking less than 1½ passes attempting to clean up the sandy chilled surface in preparation for the Kennamills, for which this operation was considered too difficult. An 8" Kennamill not only took over at this point, cleaning up this difficult surface but continued in operation, pass after pass, without regrinding. The increase in feed rate from 1.8" to 20" after conversion from high speed steel to Kennamill was just one additional justification of this technique.

One hundred cubic inches of Meehanite per minute was removed by an 8" Kennamill installed on the 55 hp Milwaukee CSM. After a cut 5" wide by .400" deep was taken at 50" per minute, a Profilometer reading showed a 30-micro-inch surface.

A dramatic demonstration of milling Dural at 150" feed rate and a magnesium alloy at 300" feed rate was performed on the Sundstrand high speed Rigidmill. The surface foot rate for both these operations was 6,300 feet per minute. In spite of the high chip loads, namely .006" and .012" respectively, the micro-inch finish according to a Profilometer reading was less than 10.

The design and manufacture of a precision tool holder in the form of a cutter body and development of a new grinding technique using a grinding block made possible demonstrations in a radically new method of grinding and blade setting. Blades of solid carbide 5/16x9/16x2½" were ground in a grinding block which incorporated all angles both cutting and clearance; the grinding as witnessed by the visitors was performed on a small bench type surface grinder equipped with a magnetic chuck and a 220 grit diamond wheel, 6" in diameter with ⅜" wide face.

The 8 blades in an 8" diameter face Kennamill were set to the shoulder of a fly cut, taken with one of these blades, in less than five minutes. A cut taken with a face Kennamill so set, immediately following the blade setting demonstration, proved to the visitors that milling can be done with exceptional finishes using this new technique.

All the blades in an 8" face Kennamill, previously used to dullness, were removed, reground and reset by hand, as described, in less than 25 minutes. The cutter bodies, or precision tool holders, numbering six, were ground and reconditioned thruout the three weeks of these operations on a small

bench type surface grinder. In addition to a marked economy in time for cutter care, this new technique eliminates errors of run-out in both arbor and spindle.

Paralleling these shop operations, classes were conducted at Spring Garden Institute. The educational material developed by Kennametal in visual sound form was used to present the "know-how" of this new method to the industrial personnel of the Philadelphia, New York and New England areas. This instructional material includes the technique of Kennamilling, not only steel and cast iron but stainless steels, wrought iron and the light alloys. Permanent classes have been arranged for the benefit of shop personnel in these areas.

"SPOT CONVEYING" BULLETIN

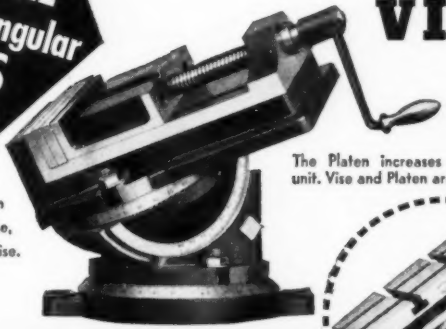
Island Equipment Corp., 101 Park Ave., New York 17, N.Y., offers a very comprehensive bulletin, 8½ x 11", 2 colors profusely illustrated, on their new Improved Power Flex Unit System.

It contains much information of interest on Spot Conveying, as well as on the details of this particular unit, with complete specifications and data.

A copy will be sent to anyone writing on his busines stationery.

SAVE TIME on intricate, angular SET-UPS

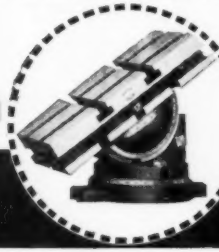
Multi-Swivel VISE



Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

Write for name of nearest distributor

The Platen increases capacity of the unit. Vise and Platen are interchangeable.



MASTER TOOL CO.
161 HIGH STREET • BOSTON, MASS.

The massive size of the world's largest wheel, brake and tire testing machine used to simulate landing effect of future giant bombers, is shown with Michael R. Riola, aeronautical engineer of the Air Technical Service Command, examining the tire after a test run. The three-quarter ton tire stops the 158 ton steel inertia wheel in 20 seconds. The 110" tire is slammed against the steel wheel as the wheel speeds around at two miles a minute, simulating actual landing conditions without risking personnel or equipment. The apparatus, designed and built by the Adamson Machine Co., Akron, O., in conjunction with the Aircraft Laboratory, Engineering Division of the AAF Air Technical Service Command, is equipped with controls and motors built by the Westinghouse Electric Corp. The machine weighs 250 tons and with it AAF engineers at Wright Field, Dayton, Ohio, check the strength and operating characteristics of new airplane landing, wheel, brake and tire assemblies. (Westinghouse photo.)

COOLANT FILTER BULLETIN

Cuno Engineering Corp., Meriden, Conn. offers a bulletin on its new Coolant-Klean filter designed to remove abrasive and metallic particles from grinder coolant. It is a compact, replaceable-element type filter, applicable to unit machines or centralized systems.

The manufacturer cites such advantages as simple, positive action for producing fine finishes; fewer replacements of the filter elements; less loading of the grinding wheels.

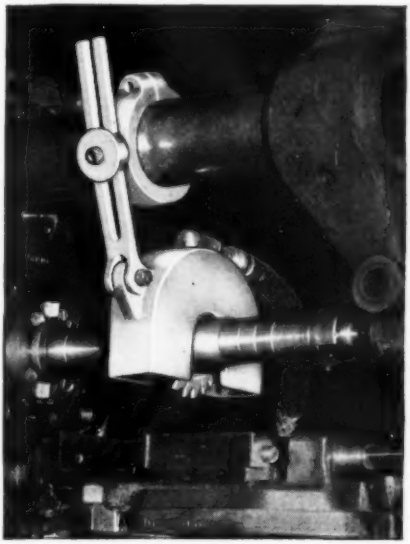
Average cost of operation is reported to be a few cents a week. Installation is accomplished in about 15 minutes, because no alteration of the grinder is required and in most cases only two hose connections are needed. The filter does not require extra pumps, electrical work, plumbing, valves, by-passes, or filter aid.

The cloth-type filter element is replaced in less than five minutes. Users have reported effective service periods up to six weeks without replacement.

The Coolant-Klean may be applied to any type of grinder and is adaptable to almost any machine using a coolant or cutting oil.

GUARDS FOR MILLING CUTTERS

A safety device to protect operators of milling machines is the aluminum Roll-O-Way cutter guard, manufactured by the Roll Away Skate Co., 4533 Payne Ave., Cleveland, O. Fitting over the cutter wheel, the guard is attached to the overarm shaft. Protection is given against hand injury from the cutter, and against face injury from flying chips. Splash is eliminated, as the coolant is fed directly into the guard. Five sizes of guards are made.

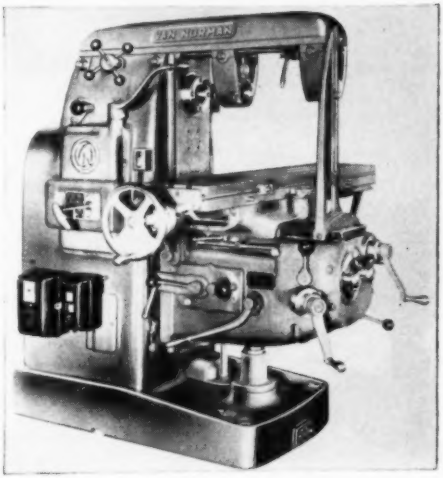


VAN NORMAN NO. 2 MEDIUM HORIZONTAL MILLER

The Van Norman Co., Springfield, Mass., announces a No. 2 Medium Horizontal Miller, especially designed for horizontal milling applications of medium size and smaller parts.

An innovation is a heavy flywheel mounted on spindle inside column assuring uniform transmission of power to cutter.

Cutter spindle is exceptionally large in diameter and is mounted on large double-opposed Timken bearings in front and straight roller bearing in rear. Large precision gears with greater tooth area are made of hardened alloy steel. Multi-splined shafts rotate on taper roller bearings.



Front and rear directional control of all power feeds is provided. These controls are actuated in the direction of desired table, saddle and knee movement. Power rapid traverse also has front and rear control. Manual feeds have large dials with convenient graduation in thousandths.

The Van Norman single lever feed selector provides quick, easy selection of 18 speeds and 18 feeds.

Feed transmission, built into the knee, has hardened alloy steel gears and multi-splined shafts. 12 changes of feeds are available thru a rotary feed selector and a high-low series lever located on side of knee.

An improved ram-type overarm is large and has dove-tail bearing on column with locking means on front and rear of column. A pilot wheel on side of column enables operator to quickly position overarm.

Built-in safety devices eliminate strain on any of the mechanisms should overload occur.

Automatic lubrication of all moving parts assures proper oiling.

Table is 50″ x 10″. A 5 hp motor provides adequate power for every type of cut. Longitudinal range is 28″, cross feed 10″, vertical feed 17″. 18 speeds are variable from 30 to 1500 rpm; 12 feeds from .5 to 36″.

No. 2 Medium is available with plain or universal saddle. Universal saddle permits table to be swiveled 45° right and 45° left. Net approximate weight is 4000 pounds.

Standard equipment includes set of wrenches, pulleys and belts; style A arbor support (hole size 23/32″); style B arbor support for 2⅛″ sleeve; outer brace, draw-in bar and coolant system.

REAL MONEY-SAVING CONVERSION

Turn Bench or Engine Lathe Into a TURRET LATHE

Convert up to 24″ swing . . for forming, roughing, boring, drilling, tapping, finishing etc. No need to stop lathe or change tools.

WRITE FOR MACHINE TOOL CATALOG

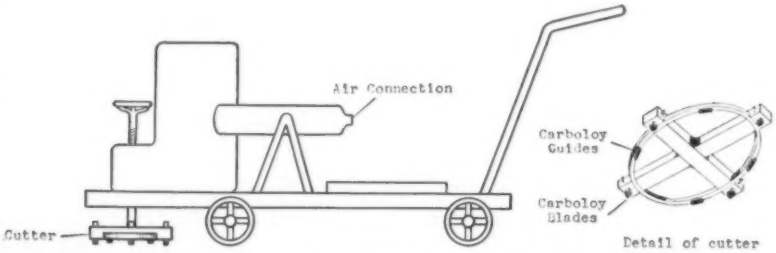
JEFFERSON MACHINE TOOL CO., 700 W. Fourth St., Cincinnati 3, Ohio

CARBIDE TIPS ON IMPROVISED CONCRETE FLOOR SCRAPER

A Carboloy-tooled rotary floor scraper that renovates concrete floors by removing encrusted and embedded dirt, oil, metal chips, and even inequalities in the concrete itself is a war-time development which should have peace time implications. Such a machine, it is reported, has been in successful operation in one large industrial plant devoted to production of war materiel. The power scraper in this shop was improvised from boiler plate, an air motor, four Carboloy standard tools, and four Carboloy standard blanks. The floor scraper produced from these materials actually re-surfaced the concrete machine shop floors as easily and quickly as a power sanding machine re-surfaces ordinary wood floors.

and motor are mounted on a small four-wheeled truck made of boiler plate. This truck was built heavy enough to hold down the cutter while in operation, yet light enough so that it could be pushed by hand up and down the aisles and around machines in the plant.

To control depth of cut and so prevent undue machining away of the concrete floor, a steel guide ring was incorporated into the cutter head as shown. Since the revolving guide ring is subject to the same conditions of wear as the cutting tools, the steel ring was protected against abrasion by the insertion—at the points indicated—of four ⅜" x ½" x 1" standard Carboloy blanks of Grade 44A—a carbide possessing great toughness and good



A Carboloy-tooled rotary scraper that renovates concrete floors by removing encrusted and embedded dirt, oil, and metal chips is a war-time development in one shop that should have peace-time implications. The cutter head of the scraper incorporates four standard Carboloy tools which do the actual scraping, and four standard Carboloy blanks which serve as guides to control depth of cut.

Lack of man power necessary to remove the abrasive and gummy conglomerates of dirt, oil, and metal chips from the shop floors by the tedious process of hand scraping was the factor which precipitated development of the mechanical "concrete-scraper".

Actual removal of the dirt-oil-chips mass is accomplished with a four bladed fly cutter (see sketch) quite similar in design to Carboloy tipped cutters used for certain fly milling operations on metal. The cutter head was built up of four standard Carboloy ½" T-18 tools tipped with Grade 78B, a "steel-cutting" grade of cemented carbide.

Cutter head is driven at approximately 100 rpm by an air motor. Head is adjusted up or down by means of a hand screw wheel, depending on thickness of the accumulation to be removed in order to get down to "clean concrete". Cutter resistance to wear. The four tools that do the scraping project 1/16" beyond the four blanks set in the guide ring. In this manner, the Carboloy blanks control the depth of cut made by the tools when the rotary scraper is in operation and also prevent undue wear on the steel guide ring.

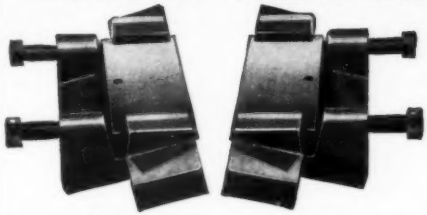
WHEEL DRESSER CATALOG

A new 16 page catalog No. 45 covers Desmond Grinding Wheel Dressers and Cutters.

Illustrated and described on these pages is one of the most complete lines of wheel dressing tools on the market, and from the various types and sizes of Dressers it is possible to select the proper type and size Dressers for use on all grinding wheels.

Copies are available from The Desmond-Stephan Mfg. Co., Urbana, Ohio.

HART'S Machine Vise Jaws



These Jaws are useful on any machine table. The angle holding the work down. Suitable to clamp or bolt to table. The hardened tool steel jaw measures 3"x6" ½" thick angle edge serrated.

HART'S Milling Fixtures

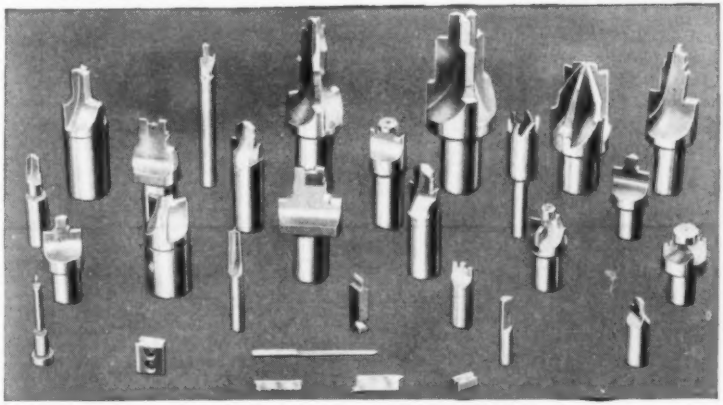
These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes —to hold stock from ½ to 5 inches.

HART MACHINE CO.

26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

"FORM-GRINDING" - - - is our business!



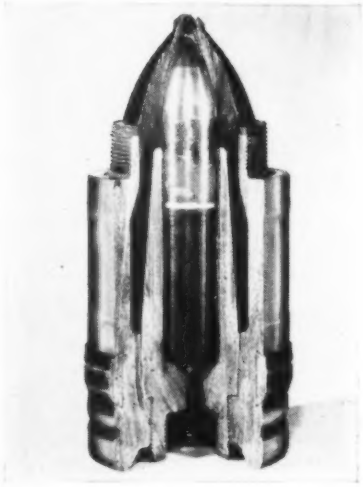
Send Your "REQUEST FOR QUOTATION" Today

J & S TOOL CO.

(MAKERS OF J. & S. "FLUID-MOTION" FORM-DRESSERS)

477 MAIN ST. - E. ORANGE 2, N. J.

BEAT GERMANS AT OWN GAME



Altho the Germans spent incredibly large sums of money, as far back as 1936, developing armor-piercing projectiles with carbide cores, apparently they never got around to producing one as simple and effective as the U.S. Army's high velocity, carbide-cored projectile which destroyed so many of their thick-skinned, heavy Tiger tanks.

German projectiles with carbide cores typical of production in the later months of the war were brought to this country by Harry Crump, assistant to the vice president of Carboloy Company, Inc., upon his return from a 3-1/2 months' investigation of German wartime industrial development as the carbide tool specialist of the U. S. Foreign Economic Administration's Technical Industrial Intelligence Commission.

A "cut-away" section of the German projectile reveals that it is composed of many parts, each carefully machined and assembled with many fine screw threads. Even plastics were used in the German projectile. Workmanship was excellent, but many parts were highly finished which did not need to be finished at all.

In contrast, the Carboloy-cored American projectile was extremely simple in design and easy to produce.

FLOOR RESURFACER

A new six-page folder, just issued by the Tufcrete Company, Des Moines 9, Iowa, describes the uses of Tufcrete Resurfacer, indoors or out, on worn floors of wood, concrete, brick, asphalt, stone, etc., either for patching or a complete new surface. Also for sidewalks, especially over areaways in front of stores, for steps, expansion joints, tennis courts, concrete window sills, platforms, ramps, spalled columns and beams, reservoirs and tanks, etc.

Turfcrete is described as an asphaltic-base liquid which, added to a concrete mixture, will bond to concrete, wood or other floors, both bottom and edges, will feather-edge and stand up under heavy traffic. Requires no chipping of ruts or holes and can be installed by ordinary labor . . . applied to worn aisles and runways without removing stock, work benches, storage bins, or machinery set in place.

ERRINGTON MECHANICAL LABORATORY

MAIN OFFICE AND WORKS: STATEN ISLAND 4, NEW YORK

Chicago Office:
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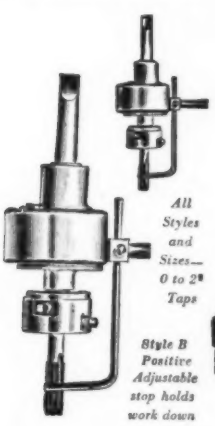
New York Office
170 BROADWAY

CLUTCH OR CONE DRIVE

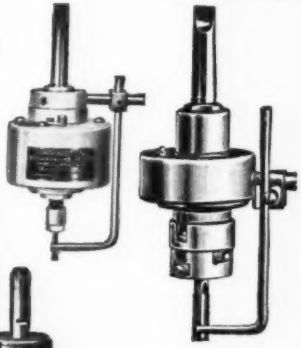
Our High Speed Tappers are Super-Sensitive for Small Tapping



All Styles and Sizes— 0 to 2" Taps

Style B Positive Adjustable stop holds work down

Style D-E, Quick Change Tools



Style C Graduated Adjustable Safety Friction

MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations

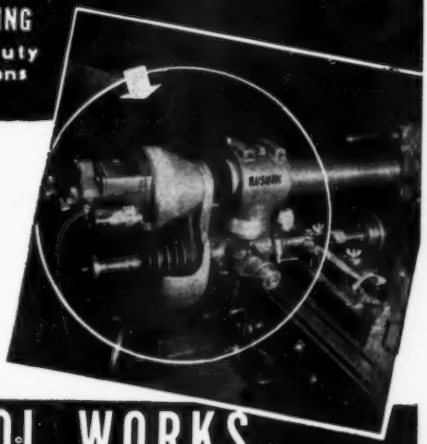


Photo shows a special operation not suited to standard straddle mill set up but easily handled by means of a RUSNOK Milling attachment used horizontally on a standard milling machine, saving one machining operation and accomplishing greater accuracy in finished piece parts. Uses many types of cutters on a wide range of work. Easily mounted—tilts to any angle. Large size spindle (No. 9 B & S taper). Takes ⅛" to ¾" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. ½ h.p. motor. Specially engineered by RUSNOK to meet modern demands for high speed, high precision, heavy duty end mill operations.

Prompt delivery.

Write for illustrated circular and prices.

RUSNOK TOOL WORKS

4840 WEST NORTH AVE. CHICAGO 39, ILL.

SMOOTHER THAN VELVET

Ten years ago a new dynamic balancing machine, designated the Dynetric, was acclaimed for its ability to analyze vibrations, due to unbalance, that have an amplitude of twenty-millionths of an inch. It was then thought that a finer degree of unbalance measurement would never be required.

However, that ability to measure unbalance effects is too crude for many present day high-speed rotating parts. This is particularly true of the wheels of gyroscopes so important in bombsights, navigation instruments, and stabilizers. The rotors of superchargers also require extremely accurate balance. To balance such parts so they may function properly and without failure, it is necessary to reduce the amplitude of vibration due to unbalance to a fraction of a millionth of an inch.

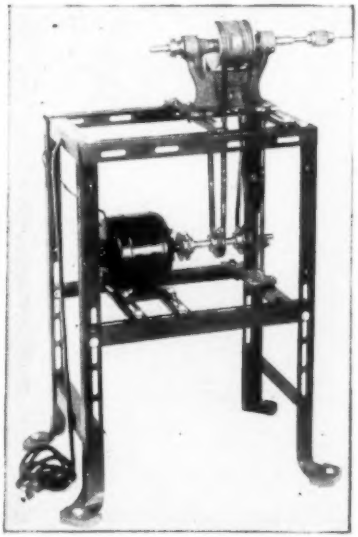
To meet these requirements for extremely accurate balance, engineers of the Westinghouse Electric Corp. and the Gisholt Machine Co., cooperated to apply a superior type of amplifier to the fundamental principles of the Dynetric Balancer. The resulting machine, the Microbalancer, can measure and locate unbalances that produce vibration amplitudes as small as a quarter of a millionth of an inch—approximately a motion corresponding with the wave-length of x-radiation—100 times more sensitive than the standard Dynetric machine. The Microbalancer measures and locates the unbalance effect produced by a weight of one-millionth of a pound at a 2½" radius on a 10 pound rotor. A piece of lint or a moist finger print weighs that much.

Many of the rotating parts which must be balanced to this order of accuracy are normally supported on ultraprecision anti-friction (ball or roller) bearings. Before these parts are balanced, the almost infinitesimal defects in the ultraprecision bearings produce vibration effects in addition to the vibration effect produced by the unbalance. These random vibrations due to the minute defects in the bearings frequently are 100 times as great as the desired minimum vibration of the balanced rotor. By use of extremely effective filters superimposed on the filtering characteristics of a wattmeter, the desired separation of vibration effect was obtained.

The device being balanced is made to provide a reference voltage without any contact being made to it. A phototube watches a tiny spot of contrasting color on the rotor. The weak synchronous pulse from the phototube is amplified to a usable reference voltage wave, which is used to provide synchronous flashing of a stroboscopic lamp by means of which the unbalance is located without random shifting due to speed changes or anti-friction bearing disturbances.

STAR TAPPING MACHINE

The Star friction drive horizontal tapping machine is simple in design and operation — just two specially treated rawhide leather discs. A slight pressure on the work and the back friction driving surface operates to start the tap into work—a slight pull on the work and the front friction drive surface revolves faster and instantly reverses the tap. Strike a hard spot and the rear friction slips; reverse slightly and proceed to tap.



A 3/8" three jaw keyless chuck is furnished together with necessary belts, motor, toggle switch and 8 ft of cord.

Any make fractional horsepower motor can be used.

Spindle runs in two high quality bronze bearings. The stand is readily adjustable to keep belts tight.

Dealer inquiries are invited by Samuel S. Gelber Co., 32 S. Jefferson St., Chicago 6, Ill.

HOLE CUTTER KIT

A handy kit for cutting holes of various diameters in wood, metal or plastics is announced by Bruno Tools, Beverly Hills, Cal., makers of Bruno Adjustable Hole Cutters and Bruno Expansive Bits for wood-boring.

The Bruno Kit No. 790 is available with straight shanks for use in drill presses, pneumatic and portable electric drills. It contains one Model No. 100 Adjustable Hole Cutter (with ¼" shank) for cutting holes ⅝" to 1¼" and one Model No. 101 (⅜" shank) that cuts holes 1" to 2½". Thus the kit covers all diameters ⅝" to 2½". Tools are equipped with high-speed steel blades having an all-purpose grind for cutting efficiently in wood, metal, transite, masonite and other "problem" materials.

EXTRUDED TENITE

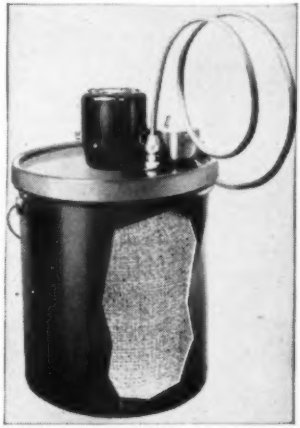
Nine primary operations in the fabrication of sheet plastic articles, and the equipment which may be used, are described and illustrated in a new 12-page booklet, "Forming Articles from Extruded Tenite Sheeting", issued by Tennessee Eastman Corp., Kingsport, Tenn.

Sheeting produced by the continuous extrusion of Tenite is a development which was recently announced in the company's booklet, "Tenite Extrusion". The general interest expressed in extruded Tenite Sheeting led to the publication of this fabricator's guide to the use of the sheeting.

The advantages of sheet extruded from Tenite, Eastman cellulose ester plastics, are said to be the inherent economy of manufacture; the variety of formulas and flows which suit Tenite to many different articles; its wide color range, luster, exceptional toughness, and resilience; and the fact that, in sheet-forming operations, lace and trim scrap may be granulated for re-use in extrusion machines, thus eliminating all waste.

STRAINCO COOLANT SYSTEM

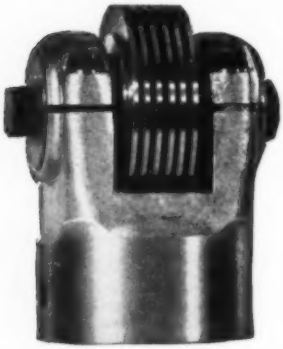
A new portable Strainco central coolant system, designed to serve as an auxiliary tank or as a central system for one to seven spindles, is announced. Known as Portable Model 127, the unit features the Strainco-Metex inter-knit fabric and wire strainer unit to keep coolant and cutting fluids clean.



A high pressure centrifugal pump is mounted on the unit's five gallon tank and provides an adjustable flow from a trickle to a steady stream. Model 127 is equipped with Stay-Put flexible tubing and discharge nozzle. The 60-cycle, 1/25 hp motor is single phase, 115 volts, 1.60 amps.

Additional data is available from Strainer Products Corp., 75-77 North Willow St., Montclair, N. J.

MULTI-DISC DRIVER



A new type multi-disc crushed process Dresser for trueing and dressing Cincinnati centerless type grinding wheels is announced.

This dresser is claimed to provide a fast cutting characteristic to the grinding wheel because it produces more sharp, natural cutting edges as compared with dressing with a diamond.

In many cases, it is reported, tests have shown that the finer grit wheel is more satisfactory than the usual coarser grit.

Other tests show that when the Multi-Disc Dresser is used there is a big saving in grinding costs based on the amount of work produced per wheel.

In one case where Multi-Disc dressers were installed for a large battery of Cincinnati Centerless Grinders the monthly cost of dressing was reduced to one-tenth of the previous costs.

Descriptive literature and prices may be had by writing The Mechanical Wheel Dresser Co., 4810 Whitfield Ave., Detroit 4, Mich.

HANCHETT MAGNETIC CHUCK

A new laminated top plate of all-steel construction (instead of brass or lead) has been added to the Hanchett electro magnetic chuck line. Pole sections traverse entire width of chuck top. Laminations are composed of magnetic steel ⅛" thick and non-magnetic steel 1/32" thick. The new design is an engineering development of Hanchett Mfg. Co., Big Rapids, Mich.

By utilizing all-steel top plate construction, the entire top plate can be hardened, thus adding production hours to life of the separate top plate. Because of the fine spacing of the poles, the smallest parts can be held without difficulty and greater magnetic surface is available.

Coils are carefully protected from moisture. In addition, installation of these coils in the chuck is arranged so that magnetic flux will be transverse to the length or opposing action of the grinding wheel or cutting tool, thus reducing possibility of work slippage.

At present, the new laminated top plate is available, without increase in cost over the same size chuck in standard design, in 6" x 18", 6" x 24", 8" x 25", 8" x 36" and 8" x 48" sizes.

ERA VARI-SPEED DRIVE

The Era Meter Co., 3940 N. Kilpatrick Ave., Chicago 41, Ill. announces a new variable speed drive attachment for Logan Lathes, with preselected speed range from 19 to 2100 rpm.

The company emphasizes the fact that speed changes may be made by simple shifting of lever, without stopping of spindle. It operates as easily as shifting the transmission of a car. It is stated that installation is simple and can be completed in less than one hour's time without disturbing the existing equipment.

This variable speed drive attachment is said to permit completion of all operations in one chucking. Specific advantages claimed are drilling of small diameter holes at proper high speeds; turning at normal cutting speeds; threading, tapping or knurling at low speeds; greatly increased production by eliminating necessity of second operation and precision and concentricity assured because of one chucking. Drives for other machines are also available.

G-SOL 195 SOLVENT

The first of a series of safety solvents to be called G-Sol has been announced by Gaybex Corp., P. O. Box 3, Nutley, N. J. Grades are identified by number indicating flash point.

G-Sols are designed with particular attention to factors of safety, non-corrosiveness and solvency range. They are water white and are characterized by high flash points and freedom from elements of toxicity and corrosion. "G-Sol 195", the first of the series has been found useful for cleaning precision bearings, instrument parts, and similar mechanisms where grease and oil gums are troublesome. It is stated that parts cleaned with G-Sol 195 appear to have more than normal resistance to rust, finger prints and other types of corrosion.

ZAGAR ANGLE DRESSER

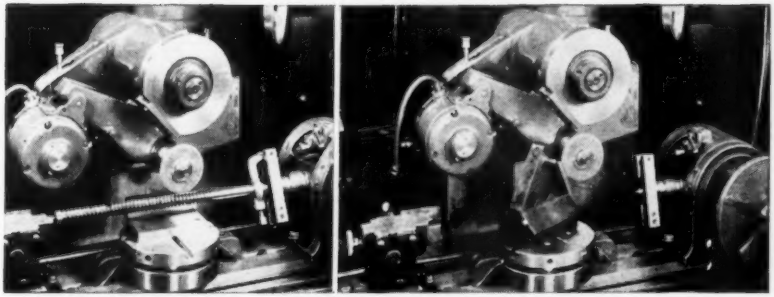


Illustration at the left shows a Dunmore grinding attachment mounted on a Brown & Sharpe grinder to form a spline broach grinder. Note the conventional dividing head and the new Zagar Angle Dresser, the latter not in use here.

Illustration at the right shows the dresser in an angular position with the extra part, upon which a diamond is fastened. The diamond is moved by hand across face of the wheel to dress the wheel. The angle is obtained thru the usual Zagar indexing method and can be changed for any angle required.

Advantages:—(1) the angle dresser can be mounted in centerline relation to the work; need not be removed for each dressing of the wheel; (2) by using an index plate (not relying upon visual graduations) any angle can be duplicated on the dresser in minimum time.

Made by Zagar Tool, Inc., 23882 Lakeland Boulevard, Cleveland 17, Ohio.

GENERAL FOOT SWITCH

The Model MK is a new, inexpensive foot switch developed by General Control Co., 1200 Soldiers Field Road, Boston 34, Mass., which offers long life and trouble-free service for a wide variety of applications. It is especially adapted for light machining operations, communications equipment, etc. Treadle is only ⅛" from floor and requires but 1/16" throw to trip switch, so that operator fatigue is reduced to a minimum. Entire toe treadle is covered by a welded steel housing, thus making switch safe from accidental actuation. Made in one type with a single pole, normally open, Acro switch element.

Switch is made of welded steel thruout, finished in baked enamel and four holes are provided in flanged base for mounting to floor.

QUALITY CONTROL PRIMER

Federal Products Corp., 1144 Eddy St., Providence 1, R. I., offers a copy of its Federal Dimensional Quality Control Primer to any concern that wishes to establish quality control methods in its plants. The Primer furnishes a practical means toward an initial approach to a subject which has frequently been surrounded by a great deal of theory and confusing ramifications. Through help of the Primer, it is believed, any firm can make a primary application of the statistical system at a machine operation. The Primer is intended to dispel also the opinion that statistical quality control is suitable only in a large organization. Samples of work and chart sheets are included with the 24-page Primer. Federal extends the offer to give any assistance or information it is possible to provide on the subject.

specially for low clearances

If you have a low-clearance problem and one of excessive dust—these Ball Valve Oilers are the answer. Little more than the ball extends above the machine or motor surface, and a strong music-wire spring forces a perfect re-seating of the ball as soon as the oil can spout is removed after each filling. Gits Ball Valve Oilers are sturdily fabricated to stand maximum abuse as are all Gits Oilers, Seals and Lubricating Devices.

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ASSEMBLY DEPARTMENT WORK

Countless assembly departments have found a good bench lathe an invaluable asset when it comes to touching up parts slightly, for making precision fits, or for replacing some odd parts, rejected for some reason. Such lathes are also indispensable when it is necessary to salvage pieces that have come thru oversize. Some bench lathes are better suited than others for these purposes, but any good lathe is far better than none.

Have you ever noticed that the same type of electrically heated tank used for heating tar, asphalt or rust-prevention compounds is also used in assembly departments to heat oils for shrink fitting? In some instances, this is about the best answer to a problem of this kind that can be found. Infra-red heat is another aspect of the tight-assembly picture that should not be overlooked.

One interesting piece of infra-red equipment holds the work on a plate glass shelf. Banks of infra-red lamps and reflectors are arranged above and below the work, heating the workpieces sufficiently to cause them to expand to the point where they can be assembled on shafts without using an assembly press. Bearings, gears, sleeves, sheaves, pulleys and handwheels are all handled and assembled to shafts in this manner.

Induction heating equipment is sometimes used in expanding parts to make for easy assembly. One company, which has made different types of electrical heating units, has developed a setup, for instance, which expands the bored ends of a crankshaft, one end at a time, to receive bushings. The bushings themselves are subjected to contrary treatment, just before assembly, being chilled in refrigerating equipment, to contract them slightly. The shaft end thus contracts somewhat, and the bushing expands a little, to produce a very tight fit, tho assembly is easy.

The press, however, retains its place for tight assembly in many cases and places.

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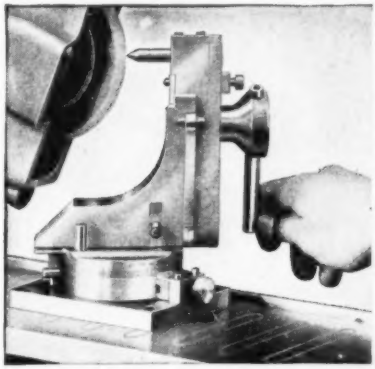

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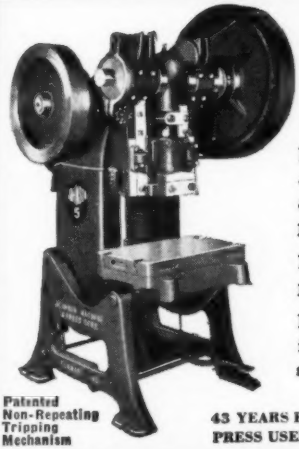

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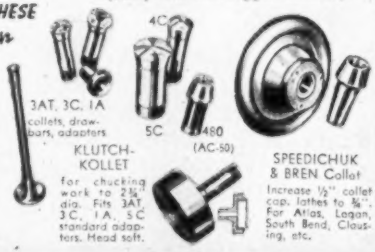
Precision lathe collets fit many machines and attachments including 10" Atlas, Logan, Craftsman, Powr-Kraft, South Bend, Clausing, Sheldon, Hardinge, Elgin, Dalton, Schauer, Sebastian, etc.



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WELDING PROBLEMS

The cutting torch or gas cutting machine is closely allied to the welding processes, for all sorts of odd-shaped parts can be and are cut out of steel plate and sheet, preliminary to assembling by the welding operation. A gas cutting machine capable of being set to cut beveled edges is of exceptional value, since it leaves a natural vee at the edge, to be filled in with deposited metal during the welding operation. Cutting circles of various radii from steel plate with beveled edges, is an interesting case in point. One cutting machine of this kind will produce bevel-edged circles anywhere from 3" to 85" in diameter, and in addition will make straight cuts of any length. This is truly a wide range, one that takes care of most of the work encountered.

Bronze welding has often been a life-saver from the standpoint of reclaiming broken shop equipment. Modern progressive shops are careful not to overlook the possibilities from this standpoint, as well as in connection with production processes. Bronze rod has been improved; rod that is low in fumes produced is available. Depositing a few hundred pounds of such rod has often reclaimed equipment of great value in unbelievably short time.

One of the interesting things that has developed in recent years in connection with arc welding is the use of some material adjacent to the weld that will prevent weld spatter, or so-called berries, from adhering to the metal. One such material, which comes in either five-gallon cans or 55-gallon drums, can be applied either by brushing or spraying. As the weld is being made, the spatter striking the applied material falls off, instead of sticking. Afterward, the material can simply be wiped off with a damp cloth.

Special weld-cleaning hammers are used to remove such spatter as adheres.

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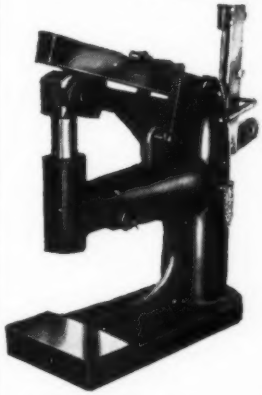

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A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

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Stroke	2"	2"	2½"
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Write for information concerning machine tool equipment for your special problems.

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HOLE-HOG
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MOLINE TOOL COMPANY
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DUST CONTROL

Proper dust control and collection are important in the metal working industries, from a number of different standpoints. They safeguard the health of workers in numerous respects. Protection against silicosis is one accomplishment. Since different types of dust are highly explosive (and this is especially true of magnesium dust), the use of proper dust control equipment often guards against fire. In nearly all cases, dust is abrasive in a considerable measure and is therefore hard on moving machinery, if it is allowed to settle on such equipment. The best method of getting rid of dust is to trap it at or near the point of its origin, and exhaust it thru individual units or a central system.

Some companies have given particular attention to dust-control problems. As a result, they are ready to install dust - collecting equipment of either wet or dry type. The dry systems are much used in collecting dust from ordinary grinding and various other metal - working operations. They are made up of an exhausting fan, together with blower pipes and hoods on the suction side of the fan, serving the various machines from which the dust is to be exhausted, plus a cyclone, or centrifugal separator, for removing dust and abrasive from the air stream on the blast side of the fan. The wet type, as made by one company, is designed to convert dust into a wet sludge. This is especially good in the case of magnesium dust, as previously mentioned.

It has been observed that some suction blower and cyclone separator units especially designed for use in connection with grinding and buffing wheels are fitted with a double intake connection. This makes it possible to pull dust away from both the top and bottom areas of wheel enclosure. Dust and grit which chances to escape lower intake is usually trapped by upper one before it can be carried into contact with the work again.

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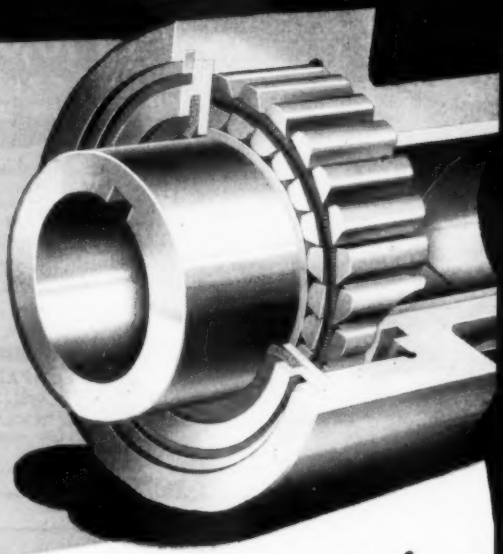
THE FULL COMPLEMENT

Over-Running Clutch



● Formsprag has an extremely high torque capacity. It is compact, simple and rugged. It is instantaneous in action, without lost motion or backlash, and over-runs freely on the slightest reduction in speed of the driving member.

Torque is applied by the gripping action of a large number of energized sprags that completely fill the annular, cylindrical space between the driving and driven members. There are no external or internal cam surfaces—no spots where localized wear can develop.

All sprags are hardened, with contours accurately form-ground to a shape that insures positive, non-slipping driving action, quick release and long life.

ARMY E NAVY

Descriptive Literature
on Request

CAPACITIES

● Formsprag Over-Running Clutches are available in both plain and ball bearing types, in a wide range of capacities. When writing for literature, it will be appreciated if you will send a description of the operation, normal and maximum torque at specified speeds, number of times per minute the clutch engages and disengages, and other pertinent information.

The GEAR GRINDING MACHINE COMPANY

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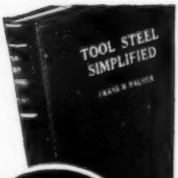

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"SELL" CHANGES TO WORKERS

To top management, made suddenly acutely cost conscious by the end of government orders and the return to competition, A. C. Croft, President, National Foremen's Institute, sounded this warning:

"Workers will not willingly and knowingly work themselves out of jobs. Therefore, improvements in work methods must be sold to them. Effort and money are well expended which give employees an understanding of why management is doing what it is doing and of how these actions will be effective in advancing their interests as well as those of the company.

"Trouble almost inevitably breaks out," he said, "when the workers know or—because of faulty 'selling' by management—suspect that all or most of the financial gains from more efficient working methods go into reserves, or are distributed solely as bonuses to top executives, or as dividends to stockholders. Their invariable response is a demand for higher wages."

Another essential, Mr. Croft believes, is a virtual guarantee by management that any worker, who, because of technological changes, loses his job or suffers a demotion or other undesirable change in his position, shall be given the utmost preference for all new job openings which may restore him to his original status.

"Temporary loss of job and status will be borne by most men, and not opposed by their sympathetic fellows, if it is really temporary. Where there is no such assurance, the change will be resisted. And the resistance does not end when the workers whose jobs were wiped out leave the plant. It remains and grows among the surviving workers, each of whom becomes fearful that it will be his turn to go when the next improvement in working methods comes along."

Many companies, he reported, have set up training programs, financed by the returns from improved working methods, which fit the displaced workers for other jobs in the plant.

ETNA SWAGING MACHINES

The Etna Machine Co., Toledo, O., announces two new series of Swaging Machines. Incorporated in these new streamlined units are basic principles of machine construction here-to-fore found only in much larger machines, the makers assert.

The two new series handle one and 1-1/2" diameters. Either hot or cold work may be handled in these new machines without any additions or changes.

The base now conceals an easily accessible coolant system. All working parts and types are completely encased free from dirt and dust Encasement of the motor driven coolant system also saves floor space. Drains and oil seals prevent oil or dirt from getting into main bearings.

The machines are finished for easy attachment of feeding devices. These feeding devices can be supplied in hand operated, semi-automatic or fully automatic styles. The type of feeding device is governed by production requirements.

The drum is of stream-lined alloy steel casting securely mounted on the base. Timken Bearings carry the main load on the spindle as well as the thrust. A radial ball bearing is provided in rear of the fly wheel.

The spindle is an alloy steel forging, heat treated and ground. A taper fit is used for the fly wheel, firmly secured by split nut and key.

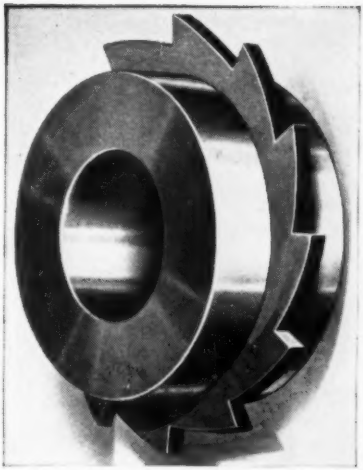
The hammers, rolls and inner-ring are all made of suitable alloy, carefully heat treated.

Motor drive is mounted encased in the base at a point of easy accessibility. Complete cross ventilation is provided.

Complete bulletins are available from The Etna Machine Co., 834 Castle, Toledo 10, O.

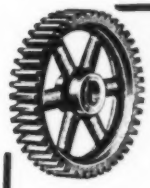
GAY-LEE SLITTING SAW

A new commutator slitting saw is designed to reduce tool breakage. Made with a steel hub permanently bonded to a Carboloy-cemented carbide blade, it is intended to eliminate fracturing due to the strain imposed by mounting screws or nuts.



In addition to the longer life made possible by this innovation, teeth are generated to provide maximum strength and long life. Cutters are slightly concave, to insure proper clearance. The new blades are said to perform undercutting and "U" slotting operations to exceptionally close tolerances. The hub is designed to support the cutting edge.

Gay-Lee commutator slitting saws are made in a wide variety of standard sizes, and in special sizes to customers' specifications. An illustrated circular is available from the Gay-Lee Co., 117 East Hazelhurst, Ferndale 20, Mich.



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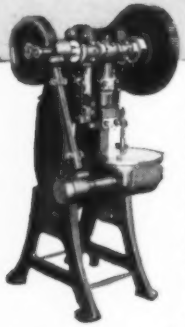

● "Put it on the Federals" has become a common expression in nearly every division of the metal-working industry. Thanks to remarkable *versatility*, Federal Dial Feed Presses now produce scores of special items which formerly required special machinery of limited utility — often increase production *speed* as much as 3 to 6 times! Exceptional *accuracy* and *safety* are equally important features. Write for catalog on the Federal line.

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BRAZING

Production brazing often is based on the proposition of assembling parts to be brazed, with the joining metal in place, and processing them thru a special brazing furnace. Those acquainted with brazing processes know that it is necessary to use care, when it is desired that the finished work shall be bright after brazing, due to the necessity of bringing it up to a temperature where oxygen in the air will act to destroy that brightness. However, this problem has been fully solved. Furnace manufacturers readily provide units that can be used for bright brazing with copper, either by the batch or continuous process.

Silver solder brazing has been used to a large extent and provides great strength in the joints. Before the development of equipment for butt welding bandsaw blades, nearly all of them were joined by silver brazing a lapped joint.

Highly important in the use of silver brazing solder is a good flux. One is available that does not harden in storage, has no lumps and is of a nature that any excess is readily removed with plain hot water. This flux is suitable for use with silver solder on all forms of stainless steels, aluminum-bronze, nickel, beryllium - copper, brass or any of their alloys and can be utilized in connection with controlled-atmosphere furnaces, as well as high frequency, resistance or torch brazing, with good results.

Brazing was employed widely in the manufacture of bombs, and some of the high-frequency equipment used for the purpose showed a production record of 75 two-pound bombs per hour. Some units employ a special induction ring in the process, and a high-frequency electric generator supplies current to this ring, at 20,000 cycles. After preparing the bomb surfaces to be joined, a ring of brazing material is placed at the joint, and the assembled parts are placed inside of ring. Passage of current thru ring causes work to heat and melt the brazing material.

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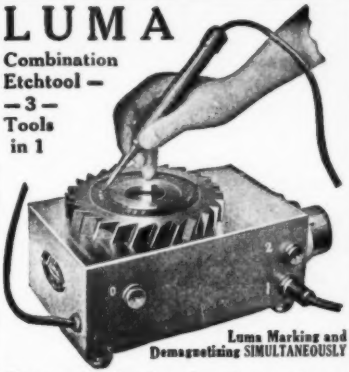

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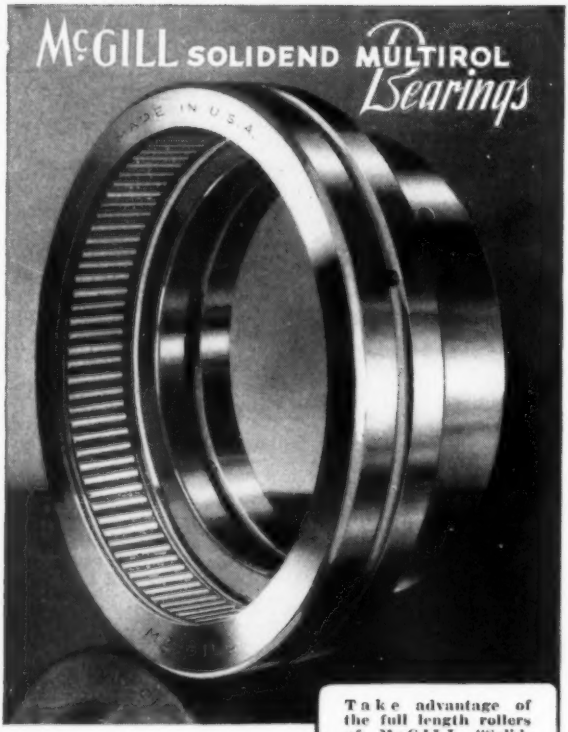

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SKIDS AND SKID HANDLING

Mental pictures of a skid may vary with different persons, but primarily, a skid is a materials handling platform, designed to carry a considerable load and elevated from the floor on runners or feet to a degree sufficient to allow a standard lift truck, either hand or power type, to run under the load, pick it up and transport it to another point. The use of skids has been growing for many years, and a number of skid variations are noted in use.

One development is half skid and half truck. The back ends of these particular skids are fitted with a pair of wheels, while iron skid feet are located under the front corners. Instead of a standard lift truck being used in connection with this type of skid, a 2-wheeled, tongued "jack" is used.

Somewhat similar live skids are made by different manufacturers. One of these provides a male fitting on the front of the skid platform, extending downward. This engages a female fitting, incorporated into the 2-wheeled jack. The company providing these makes various super-structures also, which can be used on top of the flat platforms. Some of these are fitted with stakes. Some are of the box type, and there are various others.

The array of special, non-live skids made by some of these firms is a revelation to any man who has never made a study of the possibilities of skid handling. There are various box-type skids, for handling small parts. There is a skid with two removable, solid sides, which are supported by integral stakes, reaching down into stake pockets.

There are spindle-type skids. These have spindles arising perpendicularly from the platform, spaced to suit the product being handled. Pulleys, grinding wheels, sprockets and other items having center holes are placed over these spindles and thus are securely held during handling.

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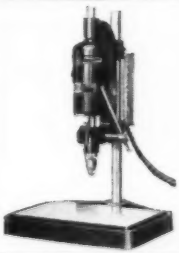

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Vibration-free variable speed, governor controlled, ball bearing motor (AC-DC) maintains maximum spindle torque from 1000 to 15000 RPM. Selective fine or coarse quill drive assures sensitive, easy and fast drilling for drills .004" to 5/32" with over 200% increased drill life. Max. chuck run-out .0001", 8 models adaptable to single or multiple head set-ups.

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LIGHT FOR SAFER LANDINGS

Among the many new developments for greater flying safety to have their debut at New York City's big Idlewild Airport, are two novel methods of marking runways for night use. The edges of one of the nearly 2-mile-long runways will be marked by a veritable curtain of light. To produce it, an entirely different type of light unit has been created by the Westinghouse Lighting Division at Cleveland.

The unit comprises two light sources mounted in a cabinet about two feet high and located just off the runway apron. One is a conventional "contact-light," which throws a flat beam of light along the edge of and into the runway. The other is a sealed-beam lamp behind a prismatic lens, often used in marine installations. This lens sends skyward a narrow fan of light.

With these units spaced 200 feet apart along each edge of the runway, the incoming pilot finds the proper runway unmistakably marked between two curtains of light even during light fog conditions. The two light sources of each unit can be burned separately or together, depending upon existing atmospheric conditions.

The second runway will be outlined by use of another type of light unit, also new. It is a high-intensity contact light, consisting of a double-ended cylindrical unit placed parallel to the runway. In each end is a high-powered sealed-beam lamp, with lens system arranged to throw a flat beam parallel to and into the runway toward the incoming pilot. The beam is of 100,000 candlepower instead of the 1,500 provided by the conventional contact light. A beam of such intensity is intended to distinguish the runway clearly even during bad atmospheric conditions.

Either or both lamps can be burned in each unit, to provide best marking with least glare to the pilot, depending on landing direction and weather. In clear weather an auxiliary lamp will be used.

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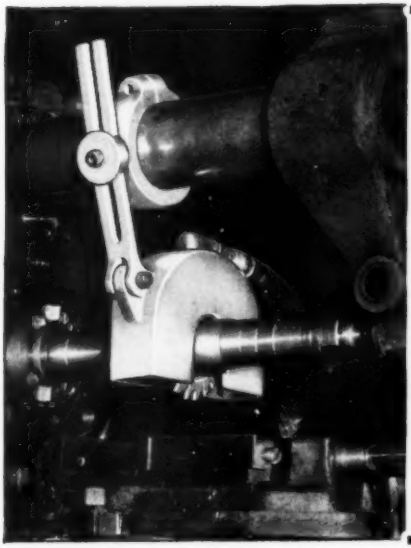

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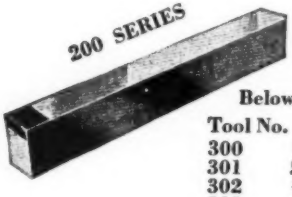
Left — 100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½



Right — 200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below — 300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

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2½	7/16	⅞	4.15
2½	½	⅞	4.15
3	3/16	1	4.10
3	¼	1	4.10
3	5/16	1	4.35
3	⅜	1	4.54
3	7/16	1	4.79
3	½	1	5.04
4	3/16	1	5.67
4	¼	1	5.67
4	5/16	1	6.36
4	⅜	1	6.36
4	7/16	1	7.12
4	½	1	7.12
4	9/16	1	7.75
4	⅝	1	7.75
4	¾	1	8.38
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5	⅝	1	10.52
5	¾	1	11.46
5	⅞	1	13.42
5	1	1	13.42
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6	¼	1	12.50
6	5/16	1	12.50
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9/32	12	9	1.85
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5/16	12	9	2.00
21/64	12	9	2.25
11/32	12	9	2.25
23/64	12	9	2.50
3/8	12	9	2.50
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13/32	12	9	2.75
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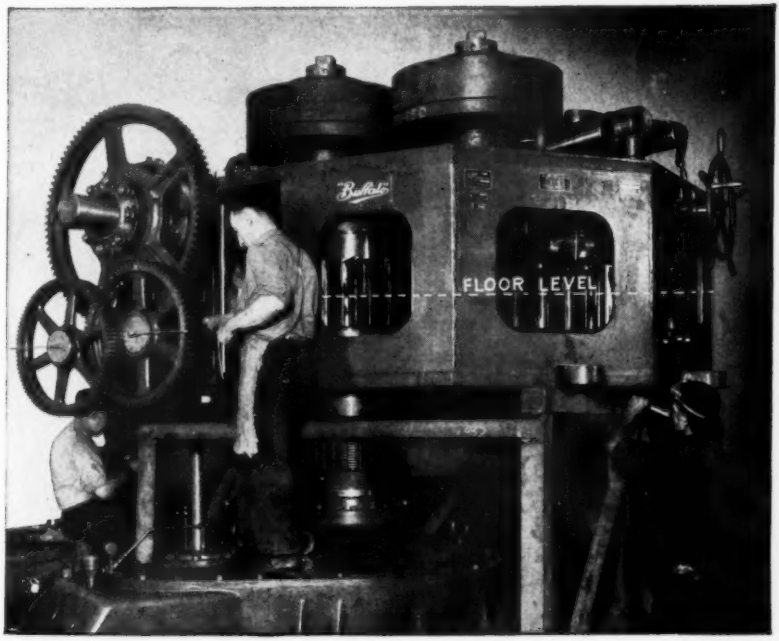

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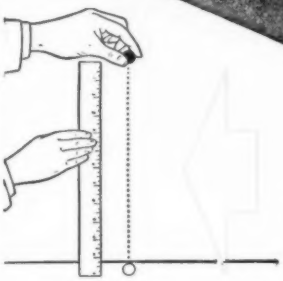

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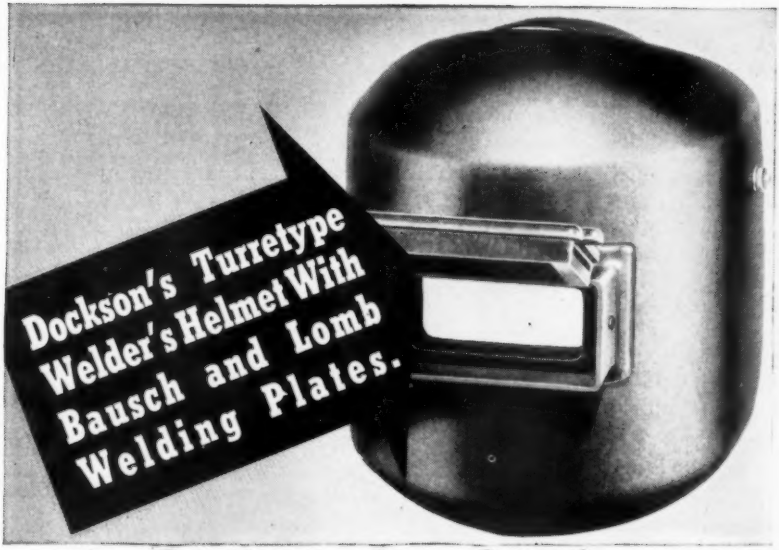

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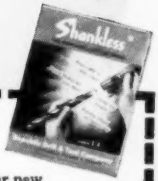

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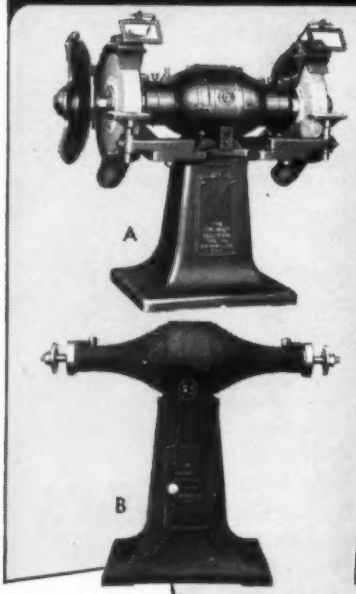

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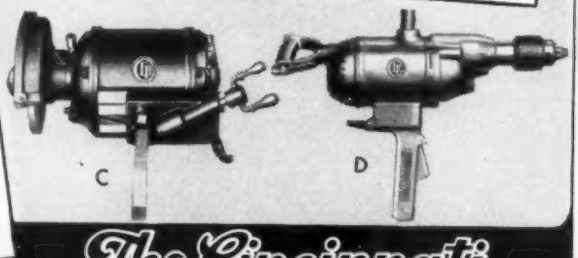

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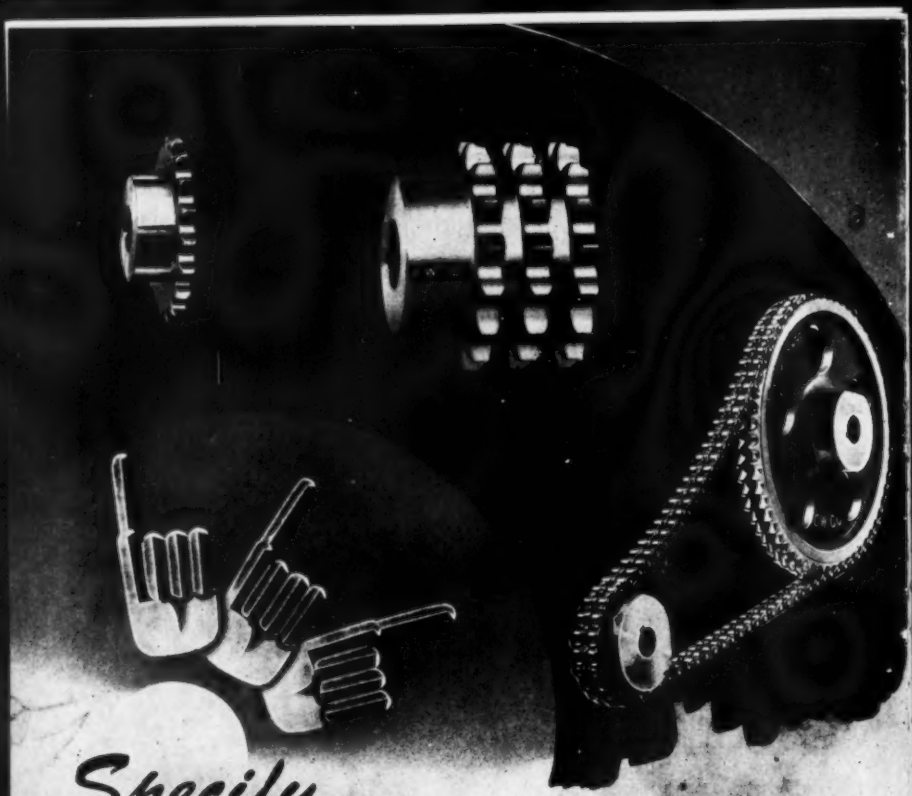

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